MONTANA'S TIMBER HARVEST AND TIMBER-USING INDUSTRY:

A Study of Relationships

Ervin G. Schuster

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Montana Forest and Conservation Experiment Station
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ABSTRACT

The livelihoods of people working in Montana's timber-using industry are directly related to timber harvest. This paper develops the information base needed to assess probable economic effects of changes in the rate or geographical distribution of timber harvest. Land managers can use this information in economic base or input-output studies to measure the economic impacts of management alternatives. This paper presents and analyzes data describing the amount of employment and wages in the timber-using industry which is supported by each million board feet of timber used. A comprehensive description of timber harvest and the geographical movement of timber from forest to mill is also presented. County-level data are presented for 1970 and 1975. State level data pertain to the 1962—1976 time period. Montana's timber harvest was found to be relatively stable over time, although patterns of harvest show considerable geographic change and shifts in ownership classes.

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Completion of this study required the active cooperation of the Montana Division of Forestry (especially Mr. Roger Bergmeier), the Montana Employment Security Division (especially Mr. Richard Gibson), the U.S. Forest Service, the Bureau of Land Management, the Bureau of Indian Affairs, the University of Montana Bureau of Business and Economic Research, and several firms in the timber-using industry. Additionally Mr. Larry Akey, Ms. Cynthia Bork, and Dr. Hans Zuuring were deeply involved in data collection and analysis. The cooperation of these organizations and individuals is gratefully appreciated.

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Cover photo–USDA Forest Service

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Ervin G. Schuster[2]

INTRODUCTION

Changes in the rate or the geographical distribution of timber harvest are important in Montana because the economic effects of such changes reach well beyond the boundaries of the timber-using industry. Secondary impacts of timber harvest changes would occur in industries associated with the timber-using industry, such as transportation and retail trade. Timber harvest change may also create economic changes in the recreation industry or other industries competing for outputs of the forest land base.

Economic trade-offs are to be expected. They are the natural consequences of resource allocation decisions. Assessment of these consequences is of real importance to resource analysts, decision-makers, and to those attempting to influence the decision-making process.

This paper is designed to improve analytical capability to measure economic impacts associated with alternative forestry programs, concentrating on one aspect—the relationship between timber harvest and economic activity in the timber-using industry. *Consumption ratios*, which are frequently used to measure this relationship, form the basis for this report. Two ratios are developed: The *employment-consumption ratio* is expressed in terms of persons employed in the timber-using industry per million board feet of timber used and the *wage-consumption ratio* is similarly expressed by wages paid per million board feet. Consumption ratios can be used to estimate primary employment and wage impacts, which can be used in economic base or input-output analyses to estimate aggregate impacts of timber harvest changes. Development of consumption ratios requires knowledge of timber harvest and use along with data regarding employment and wage levels.

In 1976, efforts were initiated to gather detailed data on Montana's timber harvest and timber-using industry. This paper presents our findings. Timber harvest data and wage and employment data were obtained by personal examination of the records of many public agencies and private organizations. In the case of harvest data, this typically involved inspection of individual timber sale records in field offices. While detailed, county-specific data were assembled for calendar years 1970 and 1975 only, the degree of specificity obtained in harvest, wage, and employment data represents a major improvement in available information. Additional state-level data on timber harvest and wages and employment were collected for the 1962-1976 period.

The objective of this paper is to describe and analyze the relationships between Montana timber harvest and use and the associated employment and wage levels. To this end, study findings will be presented in four major sections. The first section presents county-level data on timber harvest, together with wage and employment characteristics for the timber-using industry during 1970 and 1975. The second section focuses on the movement of timber from the point of harvest (origin) to the point of initial processing (destination), again for 1970 and 1975. The third section integrates county-level consumption ratios with our knowledge of timber movement. The final section develops and then analyzes changes in aggregate state-level consumption ratios for the period 1962 through 1976.

[1]The research reported here was carried out as part of Project 790-3. "Economic Aspects of Alternative Forest Management Programs: Timber Harvest and Economic Activity," of the Montana Forest and Conservation Experiment Station. This research was supported by McIntire-Stennis federal cooperative forestry research funds.

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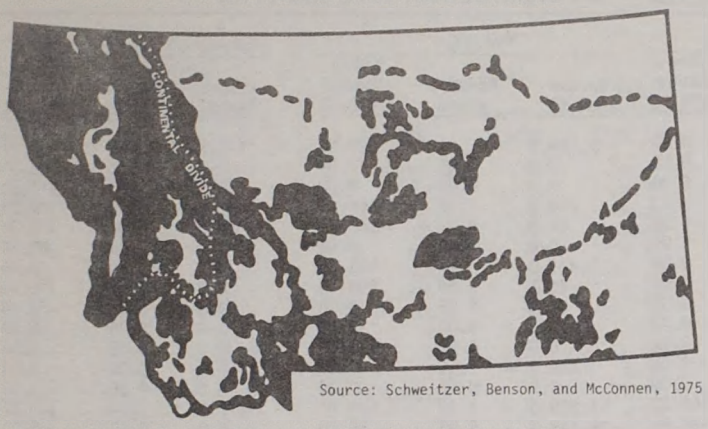


FIGURE 1. Major forest types in Montana.

HARVEST AND INDUSTRY—1970 and 1975

Montana is one of the leading forest product states in the nation. Forest Service data indicate that Montana ranks sixth nationally in total forest land and 11th in commercial forest land (USFS, 1973). These same data show Montana 16th in size of total timber harvest from growing stock.

Montana's forest resources are not distributed uniformly over the state. Figure 1 shows that the major forest types are concentrated in western Montana, especially west of the Continental Divide. This section provides a detailed look at Montana's timber harvest and the timber-using industry for 1970 and 1975.

Timber Harvest

Montana's timber harvest has averaged about 1,192 million board feet annually since 1962. Table 1 shows that Montana's 1975 harvest of 1,004 million board feet was about 16 percent below the historical average. Similarly, the 1970 harvest was below by about nine percent. Montana's timber harvest declined about eight percent between 1970 and 1975. While these two years happen to be years of low harvest volume, we shall see later that decreasing harvest levels are part of a more general decline occurring since 1968. The pattern of decline in total Montana harvest between 1970 and 1975 was followed by 25 (nearly half) of the counties. It is significant that harvest levels for all counties west of the Divide, excepting Sanders and Powell Counties, dropped. Declines in the three largest timber-producing counties accounted for about 60 percent of the total reduction. The largest percentage increase came, of course, from counties with no harvest in 1970. The largest volume increases (in excess of 11 million board feet each) were found in Judith Basin, Fergus, and Sanders Counties, in that order.

The bulk of Montana's 1975 timber harvest was concentrated in three counties–Lincoln, Flathead, and Missoula, in that order. Combined, these counties accounted for about 56 percent of the 1975 harvest, 57 percent in 1970. All counties accounting for less than one percent of the total harvest in these years are located east of the Continental Divide. Counties west of the Divide accounted for over 86 percent of the harvest total in both 1970 and 1975. The distribution of Montana's timber harvest among counties is strongly related to the amount of commercial forest land in the county, that is, larger acreages of commercial forests are associated with larger volumes of timber harvest. Based on the 1970 county distribution of commercial forests and the 1970 and 1975 harvest distribution, correlation coefficients of +0.961 for 1970 and +0.959 for 1975 were calculated. A perfect correlation would have a +1.0 coefficient value. This means that commercial forest land and timber harvest have a high, positive association, on a county basis.

But is timber harvest *proportional* to commercial forest land on a county basis? A chi-square goodness-of-fit test was conducted to determine the degree to which the pattern of commercial forest land serves as a predictor of timber harvest pattern. The analysis showed large deviations in over half of the counties. The counties most noticeable in terms of harvest exceeding expectations were Lincoln and Flathead, in that order, for both 1970 and 1975. Actual harvest in these counties exceeded that expected on an acreage basis by almost one-third. This result is not terribly unexpected since, as will be seen later, these counties contain major timber-using industries. On the other hand, counties with most noticeable deviations, in terms of harvest below expectation, were Big Horn and Lewis and Clark in 1970 and Ravalli and Granite in 1975. While data from this study cannot explain these latter deviations, informed speculation would suggest

Table 1.--Characteristics of Montana commercial forest land and timber harvest, by county, 1970 and 1975

Harvest County	1970 Commercial Forest Land[a] Area (1000 ac.)	Percent	1975 Timber Harvest Volume (mmbf)	Percent	Percent Harvest Change 1970-1975
Beaverhead	96	.75	8,981.4	.90	-50.21
Big Horn	199	1.55	1,488.0	.15	485.83
Blaine	45	.35	161.1	.02	-48.00
Broadwater	31	.24	10,134.2	1.01	74.00
Carbon	30	.23	455.8	.05	19.95
Carter	20	.15	134.2	.01	-83.60
Cascade	55	.43	3,915.7	.39	36.60
Chouteau	15	.12	48.5	.00	999.99
Custer	49	.38	0.0	.00	0.00
Daniels	0	.00	0.0	.00	0.00
Dawson	9	.07	0.0	.00	0.00
Deer Lodge	126	.28	3,669.7	.37	-78.22
Fallon	0	.00	0.0	.00	0.00
Fergus	205	1.59	14,066.7	1.40	893.62
Flathead	1,826	14.20	201,681.1	20.10	-5.98
Gallatin	179	1.39	21,409.9	2.13	-26.39
Garfield	50	.38	1,008.9	.10	999.99
Glacier	61	.47	345.4	.03	-90.86
Golden Valley	21	.16	0.0	.00	-100.00
Granite	739	5.75	22,313.9	2.22	-39.52
Hill	15	.12	0.0	.00	0.00
Jefferson	99	.77	11,321.7	1.13	56.54
Judith Basin	13	.10	1,467.6	.15	8,740.96
Lake	456	3.54	46,480.0	4.63	-6.94
Lewis and Clark	511	3.97	15,398.4	1.53	-31.82
Liberty	6	.05	0.0	.00	0.00
Lincoln	2,145	16.68	237,437.2	23.65	-12.21
Madison	113	.88	4,970.0	.50	28.76
McCone	5	.04	24.0	.00	999.99
Meagher	116	.90	14,590.9	1.45	-17.08
Mineral	682	5.30	43,029.4	4.29	-6.36
Missoula	1,325	10.30	121,905.0	12.15	-5.77
Musselshell	175	1.36	2,779.6	.28	2,308.67
Park	107	.83	11,092.9	1.11	68.63
Petroleum	24	.19	5.0	.00	-28.57
Phillips	42	.33	37.5	.00	-59.15
Pondera	16	.12	0.0	.00	-100.00
Powder River	77	.60	216.5	.02	-69.04
Powell	695	5.40	47,982.4	4.78	19.12
Prairie	0	.00	0.0	.00	0.00
Ravalli	886	6.89	28,202.1	2.81	-42.97
Richland	10	.08	0.0	.00	-100.00
Roosevelt	8	.06	0.0	.00	0.00
Rosebud	150	1.17	248.0	.02	-93.75
Sanders	1,192	9.27	119,086.1	11.87	10.75
Sheridan	0	.00	0.0	.00	0.00
Silver Bow	114	.89	7,437.3	.74	128.76
Stillwater	34	.26	122.1	.01	999.99
Sweet Grass	54	.42	224.7	.02	-86.97
Teton	18	.14	58.4	.01	-94.50
Toole	7	.05	0.0	.00	0.00
Treasure	26	.20	0.0	.00	0.00
Valley	19	.15	0.0	.00	0.00
Wheatland	5	.04	0.0	.00	-100.00
Wibaux	0	.00	0.0	.00	0.00
Yellowstone	49	.38	0.0	.00	0.00
TOTAL	12,950	100.00	1,003,932.2	100.00	-8.20

[a]Source: U.S. Forest Service, 1976.

Table 2—Characteristics of Montana timber harvest, by harvest county and organization, 1970 and 1975.

Harvest County	U.S. Forest Service			State of Montana			Private			Bureau of Land Management		
	Volume (mmbf)	Percent State	% Org. Change 1970-75	Volume (mmbf)	Percent State	% Org. Change 1970-75	Volume (mmbf)	Percent State	% Org. Change 1970-75	Volume (mmbf)	Percent State	% Org. Change 1970-75
Beaverhead	7,656.6	.76	-51.29	0.0	0.00	0.00	1,146.8	.11	999.99	178.0	.02	-92.32
Big Horn	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00
Blaine	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00	8.1	0.00	912.50
Broadwater	2,818.3	.28	-8.14	0.0	0.00	0.00	7,283.9	.73	166.99	32.0	0.00	14.29
Carbon	431.8	.04	13.63	0.0	0.00	0.00	24.0	0.00	999.99	0.0	0.00	0.00
Carter	134.2	.01	-83.60	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00
Cascade	2,416.7	.24	-6.78	0.0	0.00	0.00	1,499.0	.15	447.08	0.0	0.00	0.00
Chouteau	0.0	0.00	0.00	0.0	0.00	0.00	48.5	0.00	999.99	0.0	0.00	0.00
Custer	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00
Daniels	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00
Dawson	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00
Deer Lodge	3,019.6	.30	-16.49	0.0	0.00	0.00	650.1	.06	-95.09	0.0	0.00	0.00
Fallon	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00
Fergus	661.1	.07	-12.18	0.0	0.00	-100.00	13,029.6	1.30	2,628.71	376.0	.04	327.27
Flathead	98,225.7	9.78	-20.76	3,806.0	.38	-80.41	99,649.4	9.93	80.20	0.0	0.00	0.00
Gallatin	970.1	.10	-94.47	0.0	0.00	-100.00	20,439.8	2.04	72.25	0.0	0.00	0.00
Garfield	0.0	0.00	0.00	0.0	0.00	0.00	999.9	.10	999.99	9.0	0.00	999.99
Glacier	0.0	0.00	0.00	0.0	0.00	0.00	319.4	.03	999.99	0.0	0.00	0.00
Golden Valley	0.0	0.00	-100.00	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00
Granite	3,664.2	.36	-73.99	0.0	0.00	-100.00	14,302.8	1.42	-8.28	4,346.9	.43	-14.21
Hill	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00
Jefferson	6,293.6	.63	39.13	0.0	0.00	0.00	5,028.1	.50	98.97	0.0	0.00	-100.00
Judith Basin	1,266.0	.13	7,526.51	0.0	0.00	0.00	201.6	.02	999.99	0.0	0.00	0.00
Lake	13,211.4	1.32	66.52	613.2	.06	-67.37	9,997.8	1.00	-21.17	0.0	0.00	0.00
Lewis and Clark	1,985.5	.20	59.05	0.0	0.00	-100.00	12,959.9	1.29	-25.72	453.0	.05	999.99
Liberty	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00
Lincoln	134,699.5	13.42	-31.52	3,685.0	.37	0.00	99,052.7	9.87	34.33	0.0	0.00	0.00
Madison	490.3	.05	-71.88	0.0	0.00	0.00	4,302.0	.43	116.40	178.6	.02	38.45
McCone	0.0	0.00	0.00	0.0	0.00	0.00	24.0	0.00	999.99	0.0	0.00	0.00
Meagher	10,299.3	1.03	-37.97	0.0	0.00	0.00	4,291.6	.43	332.45	0.0	0.00	0.00
Mineral	28,709.2	2.86	-29.67	11.9	0.00	-99.51	14,308.3	1.43	431.02	0.0	0.00	0.00
Missoula	41,383.2	4.12	-45.72	1,597.9	.16	-1.72	66,874.4	6.66	42.95	266.0	.03	-90.64
Musselshell	0.0	0.00	0.00	0.0	0.00	0.00	2,779.6	.28	2,308.67	0.0	0.00	0.00
Park	4,303.7	.43	-20.83	0.0	0.00	0.00	6,789.2	.68	494.40	0.0	0.00	0.00
Petroleum	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00	5.0	0.00	-28.57
Phillips	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00	37.5	0.00	-59.15
Pondera	0.0	0.00	-100.00	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00
Powder River	41.5	0.00	-94.07	0.0	0.00	0.00	175.0	.02	999.99	0.0	0.00	0.00
Powell	2,012.5	.20	-64.72	0.0	0.00	0.00	45,185.1	4.50	45.32	784.8	.08	-77.47
Prairie	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00
Ravalli	23,640.0	2.35	-47.72	10.0	.01	999.99	4,552.1	.45	7.54	0.0	0.00	0.00
Richland	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00
Roosevelt	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00
Rosebud	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00
Sanders	46,115.1	4.59	-20.55	71.1	0.00	-15.46	65,079.0	6.48	31.74	0.0	0.00	0.00
Sheridan	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00
Silver Bow	7,420.7	.74	128.25	0.0	0.00	0.00	16.6	0.00	999.99	0.0	0.00	0.00
Stillwater	0.0	0.00	0.00	0.0	0.00	0.00	122.1	.01	999.99	0.0	0.00	0.00
Sweet Grass	111.6	.01	-15.39	0.0	0.00	0.00	113.1	.01	999.99	0.0	0.00	-100.00
Teton	58.4	.01	-94.50	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00
Toole	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00
Treasure	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00
Valley	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00
Wheatland	0.0	0.00	-100.00	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00
Wibaux	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00
Yellowstone	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00
Exports	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00
TOTAL	442,039.8	44.03	-32.18	9,795.1	.98	-65.24	501,245.4	49.93	45.58	6,674.9	.66	-57.84

public land management planning decisions and differences in timber productivity to be the major causes.

The issue of timber harvest intensity can easily be extended to organizations. Table 2 shows that about 94 percent of Montana's timber harvest came from Forest Service and private lands. Are these harvest levels consistent with the amount of commercial forest land in the ownership classes? No. The listing below shows the patterns of commercial forest land and 1975 timber harvest.

Ownership Class	% Commercial Forest Land	% 1975 Harvest
USFS	52	44.0
BLM	4	0.7
BIA	5	4.4
State	4	1.0
Private	35	49.9
Total	100	100.0

Based on these distributions, a chi-square analysis indicated that commercial forest land by organization does not provide a useful representation of the pattern of timber harvest, either for 1970 or 1975. Observed timber harvests were lower than expected for all organizations, except for the Forest Service in 1970 and private land holders in 1975. The comparatively low BLM harvest in 1970 and comparatively high private harvest in 1975 were the most important contributors to these results.

Industry Employment and Wages

Montana's forest products industry is large. How large? The answer depends primarily on the information source used. Collection of primary data for each operating unit in the industry is probably the most accurate way of determining characteristics of the industry. Unfortunately, this is very expensive. A study is currently underway that

Bureau of Indian Affairs			Total		
Volume (mmbf)	Percent State	% Org. Change 1970-75	Volume	Percent State	% Org. Change 1970-75
0.0	0.00	0.00	8,981.4	.89	-50.21
1,488.0	.15	485.83	1,488.0	.15	485.83
153.0	.02	-50.49	161.1	.02	-48.00
0.0	0.00	0.00	10,134.2	1.01	74.00
0.0	0.00	0.00	455.8	.05	19.95
0.0	0.00	0.00	134.2	.01	-83.60
0.0	0.00	0.00	3,915.7	.39	36.60
0.0	0.00	0.00	48.5	.01	999.99
0.0	0.00	0.00	0.0	0.00	0.00
0.0	0.00	0.00	0.0	0.00	0.00
0.0	0.00	0.00	0.0	0.00	0.00
0.0	0.00	0.00	3,669.7	.37	-78.22
0.0	0.00	0.00	0.0	0.00	0.00
0.0	0.00	0.00	14,066.7	1.40	893.62
0.0	0.00	-100.00	201,681.1	20.09	-5.98
0.0	0.00	0.00	21,409.9	2.13	-27.64
0.0	0.00	0.00	1,008.9	.10	999.99
26.0	0.00	-99.31	345.4	.03	-90.86
0.0	0.00	0.00	0.0	0.00	-100.00
0.0	0.00	0.00	22,313.9	2.22	-39.52
0.0	0.00	0.00	0.0	0.00	0.00
0.0	0.00	0.00	11,321.7	1.13	56.54
0.0	0.00	0.00	1,467.6	.15	8,740.96
22,657.6	2.26	-17.46	46,480.0	4.63	-6.94
0.0	0.00	0.00	15,398.4	1.53	-31.82
0.0	0.00	0.00	0.0	0.00	0.00
0.0	0.00	0.00	237,437.2	23.65	-12.21
0.0	0.00	0.00	4,970.9	.50	28.76
0.0	0.00	0.00	24.0	0.00	999.99
0.0	0.00	0.00	14,590.9	1.45	-17.08
0.0	0.00	0.00	43,029.4	4.29	-6.36
11,783.5	1.17	529.12	121,905.0	12.14	-5.77
0.0	0.00	0.00	2,779.6	.28	2,308.67
0.0	0.00	0.00	11,092.9	1.10	68.63
0.0	0.00	0.00	5.0	0.00	-28.57
0.0	0.00	0.00	37.5	0.00	-59.15
0.0	0.00	0.00	0.0	0.00	-100.00
0.0	0.00	0.00	216.5	.02	-69.04
0.0	0.00	0.00	47,982.4	4.78	19.12
0.0	0.00	0.00	0.0	0.00	0.00
0.0	0.00	0.00	28,202.1	2.81	-42.97
0.0	0.00	-100.00	0.0	0.00	-100.00
0.0	0.00	0.00	0.0	0.00	0.00
248.0	.02	-93.75	248.0	.02	-93.75
7,820.9	.78	999.99	119,086.1	11.86	10.75
0.0	0.00	0.00	0.0	0.00	0.00
0.0	0.00	0.00	7,437.3	.74	128.76
0.0	0.00	0.00	122.1	.01	999.99
0.0	0.00	0.00	224.7	.02	-86.97
0.0	0.00	0.00	58.4	.01	-94.50
0.0	0.00	0.00	0.0	0.00	0.00
0.0	0.00	0.00	0.0	0.00	0.00
0.0	0.00	0.00	0.0	0.00	0.00
0.0	0.00	0.00	0.0	0.00	-100.00
0.0	0.00	0.00	0.0	0.00	0.00
0.0	0.00	0.00	0.0	0.00	0.00
0.0	0.00	0.00	0.0	0.00	0.00
44,177.0	4.40	-17.50	1,003,932.2	100.00	-8.20

involves collection of primary data from identified processing establishments in Montana. Some results are available and others are forthcoming (White and Keegan, 1978). This study used data from the Montana Employment Security Division. Data collected on individual firms by this organization is subject to federal regulations prohibiting disclosure of data on individual firms (U.S. Code, 1939). Consequently, much published data have omissions: "d" replaces actual data to avoid disclosure problems. To avoid the omission of data, counties were aggregated so that individual firms cannot be identified. The result of this aggregation process which affected counties east of the Continental Divide is shown in Figure 2.

Montana's timber-using industry had an average annual employment of about 9.5 thousand persons in 1975.[3] Table 3

[3]The timber-using industry is defined as those firms contained in standard industrial class (SIC) 24 – lumber and wood products, except furniture, and SIC 26 – paper and allied products (OMB, 1972).

Table 3. --Amount and percent change (1970-1975) in annual employment and wages in Montana's timber-using industry,[a] by county or county aggregation,[b] 1975

County or Aggregation	Employment 1975	Employment % Chg	Wages 1975	Wages % Chg
Beaverhead	65.3	83.9	$596,823.96	320.9
Broadwater	123.5	120.9	997,995.17	228.8
Carter	0.0	0.0	0.00	0.0
Dawson	0.0	0.0	0.00	0.0
Fallon	0.0	0.0	0.00	0.0
Fergus	77.4	371.9	431,652.37	893.4
Flathead	1,717.5	- 1.5	19,746,506.01	45.9
Gallatin	362.7	5.7	3,326,236.72	50.8
Golden Valley	0.0	0.0	0.00	0.0
Granite	72.6	-32.5	582,906.82	1.4
Jefferson	10.8	6.9	65,994.44	79.5
Lake	240.9	-16.2	1,749,096.64	-10.2
Lewis and Clark	47.3	-37.4	253,123.65	-28.1
Liberty	0.0	0.0	0.00	0.0
Lincoln	1,476.1	- 5.5	15,637,765.25	21.3
Meagher	25.2	-54.7	800,952.60	135.4
Mineral	310.9	24.1	3,200,705.08	83.3
Missoula	2,096.2	24.5	24,678,290.21	12.8
Musselshell	15.4	25.2	207,164.16	249.7
Park	170.9	84.8	1,450,877.90	196.3
Powder River	0.0	0.0	0.00	0.0
Powell	27.7	-83.9	237,245.22	-79.1
Prairie	0.0	0.0	0.00	0.0
Ravalli	294.2	-19.4	2,518,261.21	5.7
Sanders	443.1	1.4	4,401,718.52	41.9
Treasure	0.0	0.0	0.00	0.0
Wibaux	0.0	0.0	0.00	0.0
Northern	26.4	-58.5	218,497.29	-51.1
Southeastern	179.5	21.8	1,791,415.19	99.1
Southwestern	42.4	-31.1	464,897.62	24.2
Central	51.1	57.2	641,684.28	227.1
Multi-county[c]	1,432.0	1,646.3	16,475,488.92	2,691.3
TOTAL	9,309.1	8.0	$100,475,299.23	53.0

[a]Timber-using industry consists of firms classified in SIC 24 and 26.

[b]County aggregates are as follows: Northern--Blaine, Chouteau, Daniels, Garfield, Glacier, Hill, McCone, Petroleum, Phillips, Pondera, Richland, Roosevelt, Sheridan, Toole, Valley; Southeastern--Big Horn, Carbon, Custer, Rosebud, Stillwater, Sweet Grass, Yellowstone; Southwestern--Deer Lodge, Madison, Silver Bow; Central--Cascade, Judith Basin, Teton, Wheatland.

[c]Multi-county consists of firms that have major business activity (e.g. sawmills) in two or more counties.

Source: Montana Employment Security Division, 1978.

shows that the bulk of these, 55.4 percent, were located in Missoula, Flathead, and Lincoln Counties. These three counties also dominated timber harvest. In aggregate, the timber-using industry acounted for 3.1 percent of Montana's total 1975 employment. This level of timber-using industry employment represented a very moderate decline relative to the 8,623 persons employed in 1970, which constituted 3.3 percent of Montana's total employment that year.

While timber industry employment dropped, wages (measured in constant 1975 dollars) actually rose by about 11 percent (53 percent in current dollars). This necessarily means that wages per person employed increased. In 1970, $10,459 was paid to each employee. In 1975, that figure rose to $10,559. This represents a 1.0 percent increase in constant dollars and a 39.0 percent increase in current dollars. Missoula, Lincoln, and Flathead Counties accounted for the largest number of employees and the largest amount of wages. Workers in these counties were paid an average wage of almost $11,354 annually, about 7.5 percent above the state industry average.

These data show that Montana's timber-using industry is relatively important to Montana's economy. It dominates the economies of some counties. But wage and employment data do not reveal the entire picture–from two aspects. First, the timber-using industry is widely accepted as a "basic" industry in Montana. Basic industries serve as the economic base for an area's economy, attracting money to the area by selling products to outsiders. These receipts may then be circulated in the economy, thereby creating employment opportunity in "non-basic" industries. Therefore, wage and employment levels, viewed in isolation, understate the

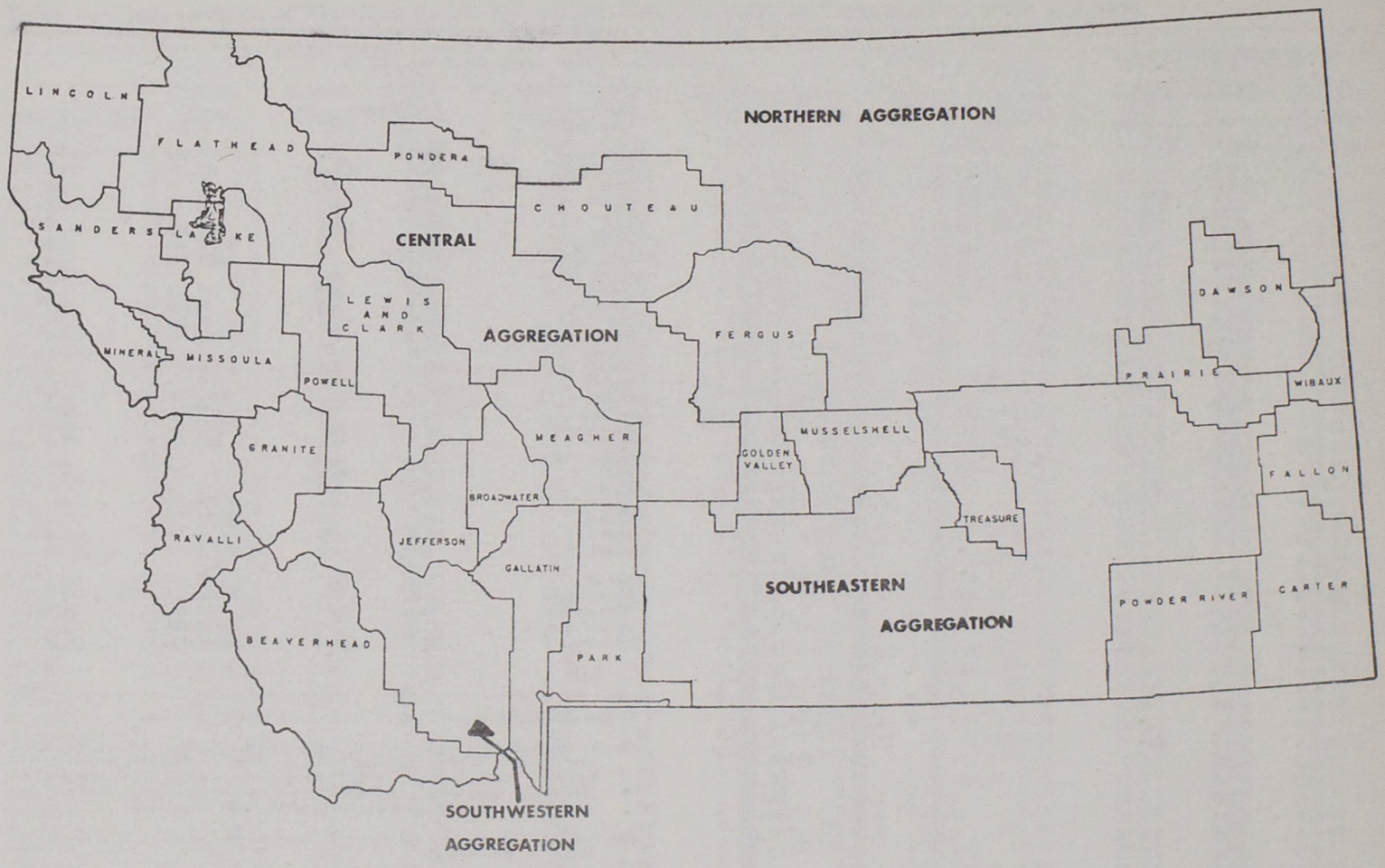


FIGURE 2. Counties and county aggregations in Montana.

significance of basic industries.

The second aspect is that wage and employment data presented are not complete. Let us look at this more closely. Wage and employment data must come from a source. Someone or something must collect these data. The objectives and procedures used to collect data limit use and applicability for other purposes. The issue at hand concerns workers covered by the provisions of unemployment or workmen's compensation laws. Most data sources, state and federal, consider "covered employment" only. Not all workers are covered, however, and therein lies the bind. How large is the timber-using industry in Montana? The answer requires knowledge of the worker who is not covered. We simply do not know how many loggers and sawmill workers there are who are not covered by unemployment and workmen's compensation.[4]

[4]The most recent Census of Population (USDC, 1973) indicated that 7,493 Montanans (16 years and older) were employed in the timber-using industry in 1970, of which 481 were self-employed or unpaid family workers not covered by unemployment or workmen's compensation. These data compare to a 1970 "covered" employment level of 8,600 persons (MES, 1978). Discrepancies between data sources are not unexpected, possibly due to some combination of multiple job holders, census versus sample, time of data collection, and other factors. These relationships suggest that the minimum real or total industry employment may be about 6.4 [= (481 - 7493) x 100] percent larger than the level portrayed by covered workers only. Similarly, in the process of conducting a state-wide survey of Oregon forest industry workers, Stevens (1976) identified a labor force almost two-thirds larger than that estimated in census data. Implications of the peripheral work force should be considered when evaluating employment impacts on the timber-using industry.

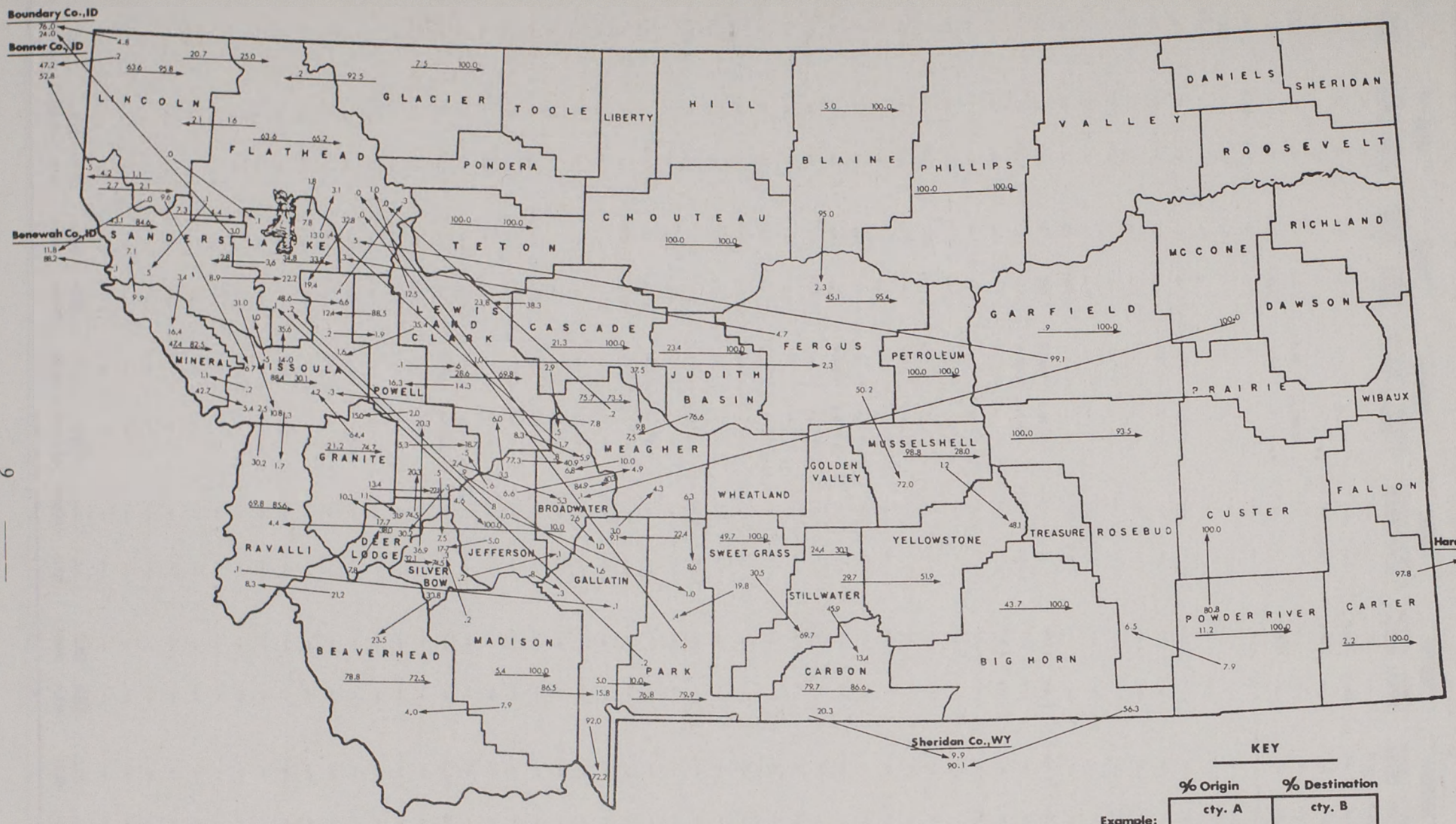
MOVEMENT OF TIMBER HARVEST 1970 and 1975

As a general rule, a portion of the timber harvested in any given Montana county remains in the county for processing and a portion is transported to other destinations. To understand the linkage between timber as a raw material and associated economic activity, one must understand the pattern of timber movement from origin to destination. This section deals with timber movement in 1970 and 1975. It considers changes in this pattern over time, as well as timber imports and exports, and comparisons of timber-producing organizations.

Origin and Destination

The pattern of timber movement from point of timber harvest to processing destination is a complex, interconnected network. Table 4 shows that timber was harvested in 38 counties and that 39 counties received timber in 1975. It should be noted that these are not necessarily the same counties. In 1970, there were 38 origin and 37 destination counties. Again, the 1970 counties were not necessarily the same as the 1975 counties. In fact, eight origin counties changed (either began to ship or stopped shipping) between 1970 and 1975 and similarly nine destination counties changed. All such changes occurred in counties lying east of the Continental Divide.

(text continued on page 15)



KEY

Example:	% Origin	% Destination
	cty. A	cty. B
	20.5 →	→ 10.9

20.5 % of cty. A harvest went to cty. B constituting 10.9 % of Montana harvest going to cty. B.

FIGURE 3. Percent of origin and destination for Montana timber harvest, 1975.

Table 4—Characteristics of Montana timber origin and destination, by county, 1970 and 1975.

County of Destination	Beaverhead		Big Horn		Blaine		Broadwater		Carbon		Carter		Cascade	
	1975 Volume	% Change 1970-75	1975 Volume	% Change 1970-75	1975 Volume	% Change 1970-75	1975 Volume	% Change 1970-75	1975 Volume	% Change 1970-75	1975 Volume	% Change 1970-75	1975 Volume	% Change 1970-75
Beaverhead	7,074.6	-9.9	--	--	--	--	--	--	--	--	--	--	--	--
Big Horn	--	--	650.0	550.0	--	--	--	--	--	--	--	--	--	--
Blaine	--	--	--	--	8.1	-97.4	--	--	--	--	--	--	--	--
Broadwater	--	--	--	--	--	--	8,602.7	47.8	--	--	--	--	112.0	999.9
Carbon	--	--	--	-100.0	--	--	--	--	363.3	42.5	--	--	--	--
Carter	--	--	--	--	--	--	--	--	--	--	3.0	999.9	--	--
Cascade	--	--	--	--	--	--	--	--	--	--	--	--	834.7	319.2
Chouteau	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Custer	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Daniels	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dawson	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Deer Lodge	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fallon	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fergus	--	--	--	--	153.0	999.9	--	--	--	--	--	--	--	--
Flathead	--	--	--	--	--	--	76.8	999.9	--	--	--	--	--	--
Gallatin	--	--	--	--	--	--	261.0	7,150.0	--	--	--	--	--	--
Garfield	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Glacier	--	--	--	--	--	--	--	--	--	--	--	--	--	-99.3
Golden Valley	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Granite	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hill	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Jefferson	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Judith Basin	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lake	--	--	--	--	--	--	176.6	999.9	--	--	--	--	--	--
Lewis and Clark	--	--	--	--	--	--	--	--	--	--	--	--	1,499.0	999.9
Liberty	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lincoln	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Madison	--	--	--	--	--	--	--	--	--	--	--	--	--	--
McCone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Meagher	--	--	--	--	--	--	--	--	--	--	--	--	1,470.0	-44.9
Mineral	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Missoula	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Musselshell	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Park	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Petroleum	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phillips	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pondera	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Powder River	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Powell	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Prairie	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ravalli	1,906.8	-81.3	--	--	--	--	1,017.1	999.9	--	--	--	--	--	--
Richland	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Roosevelt	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Rosebud	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sanders	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sheridan	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver Bow	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Stillwater	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sweet Grass	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Teton	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toole	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Treasure	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Valley	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Wheatland	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Wibaux	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Yellowstone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Exports	--	--	838.0	999.9	--	--	--	--	92.5	-26.0	131.2	-84.0	--	--
TOTAL	8,981.4	-50.21	1,488.0	485.83	161.1	-48.00	10,134.2	74.00	455.8	19.95	134.2	-83.60	3,915.7	36.60

Chouteau		Deer Lodge		Fergus		Flathead		Gallatin		Garfield		Glacier		Golden Valley	
1975 Volume	% Change 1970-75	1975 Volume	% Change 1970-75	1975 Volume	% Change 1970-75	1975 Volume	% Change 1970-75	1975 Volume	% Change 1970-75	1975 Volume	% Change 1970-75	1975 Volume	% Change 1970-75	1975 Volume	% Change 1970-75
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48.5	999.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--
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--	--	--	--	6,339.5	654.0	--	--	--	--	--	--	--	--	--	--
--	--	--	--	661.1	999.9	128,230.1	-19.8	--	--	999.9	999.9	319.4	999.9	--	--
--	--	--	-100.0	--	--	--	--	19,701.0	-27.2	--	--	--	--	--	--
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--	--	650.1	999.9	--	--	--	--	--	--	--	--	--	--	--	--
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--	--	--	-100.0	--	--	66,149.0	320.2	--	--	--	--	--	--	--	--
--	--	--	--	7,066.1	1,323.8	--	--	--	--	--	--	--	--	--	--
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--	--	2,735.1	-82.8	--	--	--	--	--	--	--	--	--	--	--	--
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--	--	--	--	--	--	--	-100.0	--	--	--	--	--	--	--	--
48.5	999.9	3,669.7	-78.22	14,066.7	893.62	201,681.1	-5.98	21,409.9	-27.64	1,008.9	999.99	345.4	-90.86	0	-100.00

Table 4 (continued)

	County of Origin															
	Granite		Jefferson		Judith Basin		Lake		Lewis and Clark		Lincoln		Madison		McCone	
County of Destination	1975 Volume	% Change 1970-75	1975 Volume	% Change 1970-75	1975 Volume	% Change 1970-75	1975 Volume	% Change 1970-75	1975 Volume	% Change 1970-75	1975 Volume	% Change 1970-75	1975 Volume	% Change 1970-75	1975 Volume	% Change 1970-75
Beaverhead	--	--	--	--	--	--	--	--	--	--	--	--	392.3	1,353.0	--	--
Big Horn	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Blaine	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Broadwater	--	--	8,749.0	136.8	--	--	--	--	1,269.3	999.9	--	--	--	--	24.0	999.9
Carbon	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carter	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cascade	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chouteau	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Custer	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Daniels	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dawson	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Deer Lodge	239.4	-78.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fallon	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fergus	--	--	--	--	--	--	--	--	154.2	999.9	--	--	--	--	--	--
Flathead	--	--	--	--	--	--	6,023.3	1.8	1,925.8	999.9	49,197.4	35.3	--	--	--	--
Gallatin	--	--	94.7	999.9	--	--	--	--	--	-100.0	--	--	4,302.0	23.7	--	--
Garfield	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Glacier	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Golden Valley	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-100.0
Granite	4,721.5	2.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hill	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Jefferson	--	--	520.3	87.4	--	--	--	--	--	--	--	--	--	--	--	--
Judith Basin	--	--	--	--	344.0	1,972.3	--	--	--	--	--	--	--	--	--	--
Lake	--	--	94.6	999.9	--	--	16,162.9	-32.6	--	--	37.7	999.9	--	--	--	--
Lewis and Clark	--	--	372.4	18.3	--	--	--	--	4,401.9	-42.8	--	--	--	--	--	--
Liberty	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lincoln	--	--	--	--	--	--	--	--	--	--	150,948.0	-27.4	--	--	--	--
Madison	--	--	--	-100.0	--	--	--	--	--	--	--	--	267.0	-24.8	--	--
McCone	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Meagher	--	--	742.3	999.9	1,123.6	999.9	--	--	--	--	--	--	--	--	--	--
Mineral	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Missoula	14,374.8	3.1	--	-100.0	--	--	22,605.6	12.9	5,452.7	-52.0	22,896.6	47.9	--	--	--	--
Musselshell	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Park	--	--	109.4	999.9	--	--	--	--	--	--	--	--	--	--	--	--
Petroleum	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phillips	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pondera	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Powder River	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Powell	2,978.2	-82.1	72.4	-88.2	--	--	--	--	2,194.5	999.9	--	--	--	--	--	--
Prairie	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ravalli	--	-100.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Richland	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Roosevelt	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Rosebud	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sanders	--	--	--	--	--	--	1,688.2	999.9	--	--	2,520.9	999.9	--	--	--	--
Sheridan	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver Bow	--	--	566.6	167.4	--	--	--	--	--	--	--	--	9.6	999.9	--	--
Stillwater	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sweet Grass	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Teton	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toole	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Treasure	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Valley	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Wheatland	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Wibaux	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Yellowstone	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Exports	--	--	--	--	--	--	--	--	--	--	11,836.6	-24.1	--	--	--	--
TOTAL	22,313.9	-39.52	11,321.7	56.54	1,467.6	8,740.96	46,480.0	-6.94	15,398.4	-31.82	237,437.2	-12.21	4,970.9	28.76	24.0	99.99

Meagher		Mineral		Missoula		Musselshell		Park		Petroleum		Phillips		Pondera	
1975 Volume	% Change 1970-75	1975 Volume	% Change 1970-75	1975 Volume	% Change 1970-75	1975 Volume	% Change 1970-75	1975 Volume	% Change 1970-75	1975 Volume	% Change 1970-75	1975 Volume	% Change 1970-75	1975 Volume	% Change 1970-75
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1,455.7	999.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--
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29.0	999.9	--	--	526.1	-96.4	--	--	69.7	999.9	--	--	--	--	--	--
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--	--	--	-100.0	17,030.7	248.1	--	--	22.1	999.9	--	--	--	--	--	--
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11,047.4	-22.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--
--	--	20,375.2	41.2	275.2	999.9	--	--	--	--	--	--	--	--	--	--
1,140.3	999.9	18,375.5	-15.1	102,849.6	-5.9	--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	2,746.0	2,279.5	--	--	--	--	--	--	--	--
918.5	-68.8	--	--	--	--	--	--	8,519.8	29.5	--	--	--	--	--	--
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--	-100.0	--	--	252.5	999.9	--	--	--	--	--	--	--	--	--	--
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--	--	--	-100.0	380.2	600.2	--	--	--	--	--	--	--	--	--	--
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--	--	4,278.7	-14.4	590.7	1,135.8	--	--	--	--	--	--	--	--	--	--
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--	--	--	--	--	--	33.6	999.9	--	--	--	--	--	--	--	--
--	--	--	-100.0	--	--	--	--	--	--	--	--	--	--	--	--
14,590.9	-17.08	43,029.4	-6.36	121,905.0	-5.77	2,779.6	2,308.67	11,092.9	68.63	5.0	-28.57	37.5	-59.15	0	-100.00

Table 4 (continued)

County of Destination	Powder River		Powell		Ravalli		Richland		Rosebud		Sanders		Silver Bow		Stillwater	
	1975 Volume	% Change 1970-75	1975 Volume	% Change 1970-75	1975 Volume	% Change 1970-75	1975 Volume	% Change 1970-75	1975 Volume	% Change 1970-75	1975 Volume	% Change 1970-75	1975 Volume	% Change 1970-75	1975 Volume	% Change 1970-75
Beaverhead	--	--	--	--	--	--	--	--	--	--	--	--	2,294.4	999.9	--	--
Big Horn	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Blaine	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Broadwater	--	--	1,139.4	999.9	--	--	--	--	--	--	--	--	16.6	999.9	--	--
Carbon	--	--	--	--	--	--	--	--	--	--	--	--	--	--	56.0	999.9
Carter	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cascade	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chouteau	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Custer	175.0	999.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Daniels	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dawson	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Deer Lodge	--	--	226.3	999.9	--	--	--	--	--	--	--	--	--	--	--	--
Fallon	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fergus	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Flathead	--	--	--	--	--	--	--	--	--	--	8,698.1	999.9	--	--	--	--
Gallatin	--	--	428.6	999.9	24.1	999.9	--	--	--	--	--	--	--	--	--	--
Garfield	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Glacier	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Golden Valley	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Granite	--	--	950.4	69.1	--	--	--	--	--	--	--	--	--	--	--	--
Hill	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Jefferson	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Judith Basin	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lake	--	--	--	--	--	--	--	--	--	--	10,614.0	-27.3	--	--	--	--
Lewis and Clark	--	--	36.8	-83.7	--	--	--	--	--	--	--	--	--	--	--	--
Liberty	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lincoln	--	--	--	--	--	--	--	--	--	--	3,244.1	39.0	--	--	--	--
Madison	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
McCone	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Meagher	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Mineral	--	--	--	--	--	--	--	--	--	--	4,057.2	92.4	--	--	--	--
Missoula	--	--	42,444.3	22.5	8,506.1	-45.9	--	--	--	--	36,871.8	59.6	--	--	--	--
Musselshell	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Park	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Petroleum	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phillips	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pondera	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Powder River	24.3	-55.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Powell	--	--	2,516.9	-48.2	--	--	--	--	--	--	--	--	2,742.1	116.3	--	--
Prairie	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ravalli	--	--	--	--	19,671.9	-41.7	--	--	--	--	--	--	--	--	--	--
Richland	--	--	--	--	--	--	--	-100.0	--	--	--	--	--	--	--	--
Roosevelt	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Rosebud	17.2	-97.3	--	--	--	--	--	--	248.0	-93.7	--	--	--	--	--	--
Sanders	--	--	--	--	--	--	--	--	--	--	51,291.9	-8.8	--	--	--	--
Sheridan	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver Bow	--	--	239.7	999.9	--	--	--	--	--	--	--	--	2,384.2	20.2	--	--
Stillwater	--	--	--	--	--	--	--	--	--	--	--	--	--	--	29.8	999.9
Sweet Grass	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Teton	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toole	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Treasure	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Valley	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Wheatland	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Wibaux	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Yellowstone	--	--	--	--	--	--	--	--	--	--	--	--	--	--	36.3	999.9
Exports	--	--	--	--	--	--	--	--	--	--	4,309.0	-52.4	--	--	--	--
TOTAL	216.5	-69.04	47,982.4	19.12	28,202.1	-42.97	0	-100.00	248.0	-93.75	119,086.1	10.75	7,437.3	128.76	122.1	999.9

Sweet Grass		Teton		Wheatland		DESTINATION TOTALS	
1975 Volume	% Change 1970-75	1975 Volume	% Change 1970-75	1975 Volume	% Change 1970-75	1975 Volume	% Change 1970-75
--	--	--	--	--	--	9,761.3	23.8
--	--	--	--	--	--	650.0	550.0
--	--	--	--	--	--	8.1	-97.4
--	--	--	--	--	--	21,368.7	124.6
--	--	--	--	--	--	419.3	2.5
--	--	--	--	--	--	3.0	999.9
--	--	--	--	--	--	834.7	319.2
--	--	--	--	--	--	48.5	999.9
--	--	--	--	--	--	175.0	999.9
--	--	--	--	--	--	0.0	0.0
--	--	--	--	--	--	0.0	0.0
--	--	--	--	--	--	750.2	-44.5
--	--	--	--	--	--	0.0	0.0
--	--	--	--	--	--	6,646.7	690.5
--	--	--	--	--	--	196,756.7	-9.2
--	--	--	--	--	--	27,292.7	-10.9
--	--	--	--	--	--	9.0	999.9
--	--	--	--	--	--	26.0	-99.3
--	--	--	--	--	--	0.0	-100.0
--	--	--	--	--	--	6,322.0	22.3
--	--	--	--	--	--	0.0	0.0
--	--	--	--	--	--	520.3	87.4
--	--	--	--	--	--	344.0	1,972.3
--	--	--	--	--	--	47,858.7	-26.8
--	--	--	--	--	--	6,310.1	-29.7
--	--	--	--	--	--	0.0	0.0
--	--	--	--	--	--	157,482.4	-26.9
--	--	--	--	--	--	267.0	-43.8
--	--	--	--	--	--	0.0	0.0
--	--	--	--	--	--	15,025.9	-11.2
--	--	--	--	--	--	24,707.6	49.4
--	--	--	--	--	--	341,666.3	19.2
--	--	--	--	--	--	9,812.1	1,504.1
44.6	999,9	--	--	--	--	10,658.6	-11.9
--	--	--	--	--	--	5.0	-28.6
--	--	--	--	--	--	37.5	-59.1
--	--	--	--	--	--	0.0	-100.0
--	--	--	--	--	--	24.3	-55.2
--	-100.0	--	--	--	--	13,491.7	-67.3
--	--	--	--	--	--	0.0	0.0
--	--	--	--	--	--	22,976.0	-48.4
--	--	--	--	--	--	0.0	-100.0
--	--	--	--	--	--	0.0	0.0
--	--	--	--	--	--	265.2	-94.2
--	--	--	--	--	--	60,662.0	-11.5
--	--	--	--	--	--	0.0	0.0
--	--	--	--	--	--	3,200.1	28.5
68.5	999.9	--	--	--	--	98.3	999.9
111.6	-17.3	--	--	--	--	111.6	-17.3
--	--	58.4	-94.5	--	--	58.4	-94.5
--	--	--	--	--	--	0.0	0.0
--	--	--	--	--	--	0.0	0.0
--	--	--	--	--	--	0.0	0.0
--	--	--	--	--	-100.0	0.0	-100.0
--	--	--	--	--	--	0.0	0.0
--	--	--	--	--	--	69.9	999.9
--	--	--	--	--	--	17,207.3	-42.9
224.7	-86.97	58.4	-94.50	0	-100.0	1,003,932.2	-8.20

(continued from page 8)

Earlier, it was indicated that both timber harvesting and employment in the timber-using industry were concentrated in three counties–Lincoln, Flathead, and Missoula. Not surprisingly, timber destination is also concentrated in these same counties. In 1970, these counties received about 718.8 million board feet or 65.7 percent of Montana's harvest. They received 695.9 million board feet in 1975, 69.3 percent of the total. The largest board foot increase between 1970 and 1975 occurred in Missoula–55.0 million board feet, an increase of 19.2 percent.

Movement of Montana timber harvest within the state is important because it shows the interdependency of counties in terms of harvest and industrial roundwood needs. Figure 3 provides a visual display of this complex pattern of linkages. In both 1970 and 1975, only 15 counties did not export any timber harvest. Flathead and Missoula Counties were associated with the most import movement, receiving timber from 12 and 11 counties, respectively, in 1975.

Data such as those in Figure 3 lead to questions concerning self-sufficiency and linkages. Are there any ways of quantitatively characterizing such issues? Yes. Table 5 presents a summary of these characterizations. Counties can be evaluated in terms of the service roles played by their timber harvests. Service counties export relatively large amounts of timber to other counties. Several counties are shown to be almost entirely service–Blaine, Glacier, and Jefferson for both 1970 and 1975. While it is tempting to suggest that import counties are the opposite of export counties, a more meaningful distinction involves the degree of self-sufficiency. Self-sufficiency refers to the county's ability to supply its industrial roundwood needs from its own harvest level. Sixteen counties, including Big Horn, Blaine, and Cascade, are entirely self-sufficient. At the other end of the scale, Missoula and Musselshell counties are least self-sufficient. These counties are heavily dependent on timber receipts from other counties. The most self-sufficient counties tend to be east of the Continental Divide, with the most dependent tending to be west of the Divide. Additionally, counties with active timber-using industries tend to be less self-sufficient.

The degree to which a county is a timber "sink" or "source" is an indication of the role it plays in the overall timber economy of Montana. A sink county is one to which other counties send their harvested timber. Flathead, Lincoln, and Missoula Counties are the major Montana timber sinks. Again, the timber-using industry is located in these counties. Counties providing large volumes of timber to other counties are source counties. Flathead, Lincoln and Sanders Counties were the most important sources of timber for other Montana counties in both 1970 and 1975. Accordingly, Flathead and Lincoln Counties were both the major sinks and the major sources for these years.

Organization Differences

It has been mentioned that Montana's timber harvest is concentrated both in terms of counties and organizations. But how do these organizations compare in terms of origin and destination of timber? How about trends over time? Tables 6 and 7 deal with these issues.

Table 6 shows that the same handful of counties supplies nearly all of every organization's harvest. Moreover, certain

Table 5—Interrelatedness characteristics of Montana timber harvest and use, by county 1970 and 1975.

County	1970 Export Index	1970 Self-sufficiency Index	1970 Sink Index	1970 Source Index	1975 Export Index	1975 Self-sufficiency Index	1975 Sink Index	1975 Source Index
Beaverhead	56.5	99.66	.72	.93	21.23	72.48	.70	.19
Big Horn	60.6	100.00	.01	.01	56.32	100.00	.06	.09
Blaine	0.0	100.00	.03	0.00	94.97	100.00	0.00	.02
Broadwater	.1	61.17	.53	0.00	15.11	40.26	.86	.15
Carbon	32.9	62.35	.02	.01	20.29	86.64	.04	.01
Carter	0.0	0.00	0.00	.07	97.76	100.00	0.00	.01
Cascade	93.1	100.00	.02	.24	78.68	100.00	.08	.31
Chouteau	-- b	--	--	--	0.00	100.00	0.00	0.00
Custer	--	--	--	--	0.00	0.00	0.00	
Daniels	--	--	--	--	--	--	--	--
Dawson	--	--	--	--	--	--	--	--
Deer Lodge	98.6	17.18	.02	1.52	92.25	37.92	.03	.34
Fallon	--	--	--	--	--	--	--	--
Fergus	40.6	100.00	.08	.05	54.93	95.38	.63	.83
Flathead	25.4	73.79	14.62	4.99	36.42	65.17	12.77	7.32
Gallatin	8.5	88.39	2.48	.23	7.98	72.18	1.96	.17
Garfield	--	--	--	--	99.11	100.00	0.00	.10
Glacier	0.0	100.00	.35	0.00	92.47	100.00	0.00	.03
Golden Valley	0.0	100.00	0.00	0.00	--	--	--	--
Granite	87.5	89.12	.42	2.95	78.84	74.68	.47	1.75
Hill	--	--	--	--	--	--	--	--
Jefferson	96.2	100.00	.03	.63	95.40	100.00	.05	1.08
Judith Basin	--	100.00	0.00	0.00	76.56	100.00	.03	.12
Lake	52.0	36.72	2.19	2.38	65.23	33.77	1.61	3.02
Lewis and Clark	65.9	85.73	.70	1.37	71.41	69.76	.44	1.09
Liberty	--	--	--	--	--	--	--	--
Lincoln	24.9	94.26	18.56	6.17	36.43	95.85	15.04	8.61
Madison	90.8	74.66	.03	.32	94.63	100.00	.03	.47
McCone	--	--	--	--	0.00	0.00	0.00	0.00
Meagher	19.0	84.23	1.30	.31	24.29	73.52	1.10	.35
Mineral	68.6	87.25	1.32	2.88	52.65	82.47	2.03	2.26
Missoula	15.6	38.11	9.99	1.39	15.63	30.10	10.24	1.90
Musselshell	0.0	18.87	.01	0.00	1.21	27.99	.27	.01
Park	0.0	54.40	.60	0.00	23.20	79.93	.85	.25
Petroleum	0.0	100.00	0.00	0.00	0.00	100.00	0.00	0.00
Phillips	0.0	100.00	.01	0.00	0.00	100.00	0.00	0.00
Pondera	0.0	100.00	0.00	0.00	--	--	--	--
Powder River	92.2	100.00	0.00	.06	88.78	100.00	0.00	.02
Powell	88.0	11.75	.44	3.62	94.75	18.66	.25	4.53
Prairie	--	--	--	--	--	--	--	--
Ravalli	31.8	75.64	3.08	1.44	30.25	85.62	1.96	.85
Richland	0.0	100.00	.01	0.00	--	--	--	--
Roosevelt	--	--	--	--	--	--	--	--
Rosebud	0.0	86.01	.36	0.00	0.00	93.51	.02	0.00
Sanders	47.7	82.12	5.14	4.69	56.93	84.55	5.11	6.75
Sheridan	--	--	--	--	--	--	--	--
Silver Bow	39.0	79.63	.18	.12	67.94	74.50	.24	.50
Stillwater	--	--	--	--	75.59	30.32	0.00	.01
Sweet Grass	92.2	100.00	.01	.15	50.33	100.00	.01	.01
Teton	0.0	100.00	.10	0.00	0.00	100.00	.01	0.00
Toole	--	--	--	--	--	--	--	--
Treasure	--	--	--	--	--	--	--	--
Valley	--	--	--	--	--	--	--	--
Wheatland	0.0	100.00	.02	0.00	--	--	--	--
Wibaux	--	--	--	--	--	--	--	--
Yellowstone	--	--	--	--	100.00	0.00	0.00	0.00

a.
Export Index--Percentage of county harvest exported out of county.
Self-sufficiency Index--Percentage of county timber receipts (Montana-based) received from self.
Sink Index--Percentage of total Montana harvest delivered to county.
Source Index--Percentage of total Montana timber receipts provided by subject county to other counties.

b.-- signifies counties which neither receive nor produce timber.

counties tend to dominate an organization's timber harvest–Granite and Powell Counties dominate the BLM, Lake County dominates BIA, and Flathead and Lincoln Counties dominate State harvest.[5] For both 1970 and 1975, nine counties represented the origin for between three-fourths of Forest Service (USFS) and virtually all of the State harvest, these counties generally lying west of the Continental Divide. The patterns of harvest for the Forest Service and for private organizations are virtually identical in both 1970 and 1975. Harvest was distributed over most of the counties. Large shifts in harvest origin were found for the other organizations. The BLM showed a relative increase in Granite County harvest; the BIA shifted harvest from Flathead to Missoula County, and the State shifted harvest from Flathead to Lincoln County between 1970 and 1975.

Like timber origin, timber destination is also concentrated (Table 7). Seven counties received over three-fourths of each organization's timber harvest. Destination of Forest Service and private harvest was both most diverse (in terms of counties involved) and most stable. On the other hand, both the BLM and the BIA made large shifts to Missoula as destination county. The State shifted from Lake to Lincoln County.[6]

Exports and Imports

The patterns of timber movement to and from Montana during 1970 and 1975 will be complete upon consideration of timber imports and exports at the state level. We earlier discussed the concept of export counties in terms of timber leaving a county. Attention is now turned to timber entering and leaving Montana.

Data presented earlier show that about 2.8 percent of the 1970 timber harvest and 1.7 percent of the 1975 harvest was exported from Montana. The listing below shows that the bulk of Montana exports came from Lincoln County during both 1970 and 1975. Timber harvested from Forest Service lands accounted for 96.9 percent of Montana exports in 1970 and 93.8 percent in 1975.

Export Origin	% 1975	% Change from 1970
Big Horn	5.0	+999.9
Carbon	0.5	- 26.0
Carter	0.8	- 84.0
Flathead	0.0	-100.0
Lincoln	68.2	- 26.2
Mineral	0.0	-100.0
Sanders	25.5	- 52.4
Total	100.0	- 43.0

Virtually all of Montana's timber exports go to Idaho. Table 8 shows that about 96.9 percent of the 1970 exports and 93.8 percent of the exports in 1975 went to Idaho. In 1970, Bonner County, Idaho, received about three-fourths of all Montana exports. In 1975, about 86.4 percent went to Boundary County, Idaho. For the years studied, very small amounts of timber were exported to Wyoming and South Dakota. No timber was moved to any other state or nation.

[5]In this study, *State* refers to lands managed by the Montana Department of State Lands and the Department of Natural Resources and Conservation.
[6]Tables A1 through A4 in the appendix provide detailed data on timber movements associated with organizations.

Timber exports were easily determined in this study. Imports were not so easily determined, since data were obtained from land managing organizations rather than the mill operators who do the importing. Therefore, an understanding of timber imports must be obtained from other sources.

Two usable sources exist–one for 1970 and another for 1975. The Bureau of Business and Economic Research is currently conducting a study of timber processing plants in Montana (BBER, 1977) for 1976. One of the questions asked in this study related to timber origin. This study showed that Sanders, Mineral, Missoula, Ravalli, Gallatin, and Lincoln counties received timber from non-Montana origins. All such receipts came from Idaho, totaling 58.1 million board feet in 1976. The second relevant study was conducted by the Forest Service (c1973). This study attempted to identify the destination of national forest timber in the Northern Region for fiscal years (FY) 1969 and 1970. Data indicate that Mineral, Missoula, Lincoln, and Sanders counties received 76.4 and 69.6 million board feet in FY 1969 and FY 1970, respectively. All receipts again came from Idaho.

Judgments on timber imports were based on these two studies. The patterns of imports found for 1976 was assumed to be applicable to 1975, but the level was rounded to 58 million board feet. Similarly, the imports for FY 1969 and FY 1970 were averaged and the total rounded to 73 million

Table 6. --Percent of Montana timber harvest, by major county of origin and organization, 1970-1975

Origin County	USFS		BLM		BIA		State		Private	
	1970	1975	1970	1975	1970	1975	1970	1975	1970	1975
Beaverhead	2.4	1.7	14.7	2.7	--	--	--	--	--	.2
Flathead	19.0	22.2	--	--	29.5	--	68.9	38.9	16.1	19.9
Granite	2.2	.8	32.0	65.1	--	--	7.6	--	4.5	2.9
Lake	1.2	2.5	--	--	51.3	51.3	6.7	6.3	3.7	2.0
Lincoln	30.2	30.5	--	--	--	--	.1	37.6	21.4	19.8
Missoula	11.8	9.4	18.0	4.0	3.5	26.7	5.8	16.3	13.6	13.3
Powell	.9	.5	22.0	11.8	--	--	--	--	9.0	9.0
Sanders	8.9	10.4	--	--	--	17.7	.3	.7	14.3	13.0
Sweet Grass	--	--	10.1	0.0	--	--	--	--	--	--
Subtotal	76.6	78.0	96.8	83.6	84.3	95.7	89.4	99.8	82.6	80.1
All others	23.4	22.0	3.2	16.4	15.7	4.3	10.6	0.2	17.4	19.9
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table 7. --Percent of Montana timber harvest, by major county of destination and organization, 1970 and 1975

Destination County	USFS		BLM		BIA		State		Private	
	1970	1975	1970	1975	1970	1975	1970	1975	1970	1975
Beaverhead	.9	2.1	14.8	4.4	--	--	--	--	--	--
Flathead	23.3	31.8	--	--	--	--	17.5	45.7	17.4	10.4
Lake	2.0	2.5	--	--	39.0	11.1	43.6	4.8	5.6	6.3
Lincoln	26.3	20.5	--	--	--	--	11.6	32.3	11.9	12.7
Missoula	16.5	13.9	58.4	72.1	31.9	67.7	17.4	16.3	43.0	48.6
Powell	2.5	1.7	16.2	.2	--	--	--	--	6.5	1.2
Sanders	7.1	7.5	--	--	13.4	16.9	.3	.7	4.4	4.0
Subtotal	78.6	80.0	89.4	76.7	84.3	95.7	90.4	99.8	88.8	83.2
All others	21.4	20.0	10.6	23.3	15.7	4.3	9.6	.2	11.2	16.8
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table 8. --Characteristics of Montana timber harvest export, by harvest destination, 1970 and 1975

Export Destination	1975 Timber Export		Percent Export
	Volume	Percent	Change 1970-1975
	(mbf)		
Idaho			
Benewah County	175.3	1.02	999.99
Bonner County	1,101.0	6.40	-95.38
Boundary County	14,869.3	86.41	1,413.88
Shoshone County	0.0	0.00	-100.00
Subtotal	16,145.6	93.83	- 44.77
Wyoming			
Park County	0.0	0.00	0.00
Sheridan County	930.5	5.41	644.40
Subtotal	930.5	5.41	644.40
South Dakota			
Harding County	131.2	.76	-83.96
North Dakota	0.0	0.00	0.00
Minnesota	0.0	0.00	0.00
Washington	0.0	0.00	0.00
Canada	0.0	0.00	0.00
TOTAL	17,207.3	100.00	-43.00

board feet. The outcome of these judgments resulted in the pattern of timber imports shown in the list below.

Destination County	Estimated Imports 1970	1975
	(million board feet)	
Gallatin	-	3.3
Lincoln	9.2	11.7
Mineral	28.5	26.4
Missoula	16.1	.9
Ravalli	-	11.0
Sanders	19.2	4.7
Total	73.0	58.0

Based on our investigations, we are comfortable with the 1975 import level. The mix between Forest Service and private imports to Montana shown by Koss (1975) for 1967 and 1972 suggest that, if anything, our judgment for 1970 may be low.

The amounts of timber used by Montana's timber industry equals the timber harvest minus the volume exported plus the volume imported. The listing below summarizes these characteristics for 1970 and 1975.

Characteristics	1970	1975
	(million board feet)	
Harvest	1,093.6	1,003.9
Exports	- 30.2	- 17.2
Imports	+ 73.0	+ 58.0
Timber Used:	=1,136.4	=1,044.7

These levels of timber use are helpful in evaluating the relationship between timber used and wages and employment in Montana's timber-using industry. This relationship will now be considered.

HARVEST AND INDUSTRY RELATIONSHIPS 1970 and 1975

Data already presented on timber harvest and consumption, together with the pattern of timber movement from county to county, and employment and wages paid in each county's timber-using industry can now be integrated. This section focuses on county-level consumption ratios reflecting timber movements. Calculation of consumption ratios requires a division of employment or wage levels by timber used. Ratios are normally measured in terms of employment or wages per million board feet of timber used. The data base is applicable to 1970 and 1975. The primary issue dealt with is the relationship between timber harvest in a particular location and the wage and employment effects on the timber-using industry, given the pattern of timber movement. This will be done by first considering county-level consumption ratios and then adding timber movements.

County Consumption Ratios

Data presented earlier are not exactly appropriate to determine county consumption ratios. The difficulty lies in the fact that employment and wage data shown in Table 3 contain a geographical category of "multi-county." This category includes firms (only a few in number) that conduct a major portion of their business in two or more counties. For the present analysis, wages and employment for multi-county firms must be apportioned to specific geographical areas. Table 9 shows the result of this apportionment. The aggregate level of multi-county activity was allocated to specific counties and county aggregations on a percentage basis. If, for example, a county accounted for 10 percent of all timber-using industry employment (excluding multi-county employment), then 10 percent of the multi-county employment was allocated to that county. Wages paid were handled identically. Proportionate allocation probably under-allocated wage and employment to counties with major timber-using industries and over-allocated to those with a minor industry. The result of this procedure was maintenance of county rank with regard to wage and employment levels.

Table 10 shows the 1975 employment-consumption and wage-consumption ratios for each county or county aggregation. The percentage changes from 1970 and the 1975 wages per employee are also shown. These data show a statewide employment-consumption ratio of 8.77 and a wage-consumption ratio of $94,616 for 1975, reflecting an adjustment for timber imports and exports. As such, they are based on timber used in a county. Adjustments were based on the import-export analysis previously discussed.

The reader will observe wide differences in ratios. For example, Missoula County has an employment-consumption ratio of 7.23 (employees per million board feet timber used) while Jefferson County's ratio is 24.60, many fold larger. How can these differences be explained? First, the ratios are the result of division. Counties (like Jefferson) with some timber-using industry employment (12.8 in 1975) which receive almost no timber (.52 mmbf) will have extremely large consumption ratios. The nature of the data base and the method of analysis are the culprits. Second, not all timber-using industry employment is dependent on timber in the form of roundwood. For example, SIC 2451 includes establishments primarily engaged in manufacturing mobile homes. This class of firm does not process roundwood; employment can exist without any roundwood deliveries. Similarly, roundwood deliveries to a county are based on identification of initial destination. Subsequent inter-county transfer of roundwood remains unknown. The problem faced by any study is specificity. The degree of data

detail needed to measure all possible variables was simply beyond the scope of this study.

Use of consumption ratios probably should depend on the specific county being evaluated. For major timber-using counties, use of county-level ratios probably makes sense, the amount of ambiguity being dwarfed by the magnitude of the situation. For counties with minor timber-using industries, counties should be combined, thereby internalizing ambiguity. One of the most effective ways of combining counties is by considering the relationship between timber harvest and the county using the harvested timber.

County Timber Harvest Multipliers

The primary economic effect of timber harvest in a particular county is shown initially by the pattern of timber movement from county of origin to county of destination, and then by the relationship between timber consumption and employment and wages in the counties of destination. Figure 3 showed the pattern of timber movement for Montana counties in 1975. Table 10 showed the 1975 employment and wage consumption ratios for destination counties. These two sets of data have been combined into Table 11.

Table 11 is organized around timber movements. It shows the distribution of employment in counties receiving timber associated with each million board feet of timber harvested in origin counties. These relationships already reflect the fact that some harvested timber may be exported from Montana and some timber consumed may be imported from outside the state. As such, the employment and wages associated with Montana timber exports are not shown. The table considers Montana to be an open system. A proper interpretation of Table 11 is as follows: In 1975, every million board feet of timber harvested in Beaverhead County was associated with employment levels of 6.23 in Beaverhead and 2.18 in Ravalli Counties; furthermore, employment in Beaverhead County is specified on the basis of 6.23 employees per million board feet of timber harvested in Beaverhead County and 1.32 in the Southwestern Region.

A numerical example may better illustrate the meaning of this table. About 8.981 million board feet of timber were harvested in Beaverhead County during 1975 (Table 2); this harvest was associated with employment levels of 56.0 (= 6.23 x 8.981) in Beaverhead and 19.6 (= 2.18 x 8.981) in Ravalli Counties; furthermore, an employment level of 21.2 (= 1.32 x 16.08) in Beaverhead County was associated with the 16.08 million board feet harvested in the Southwestern Region. Beaverhead County employment associated with timber cut in Beaverhead County totalled 77.2 (= 56.0 + 21.2); this is the same total as shown in Table 9.

What about wages paid? A harvest-wage multiplier table, identical to Table 11 but dealing with wages, could be developed. It was not, however, since it would be a linear transform of Table 11. To generate wage totals, refer to Beaverhead County in Table 10 which shows $9,245 of wages per employee. The total wages paid, $713.7 thousand (= 9245 x 77.2), is only slightly smaller than the wage level shown in Table 9, due to rounding error.

How are data in Table 11 intended to be used? On the one hand, the economic interdependency among various Montana counties is visually displayed. Table 11 can be used to describe these relationships. It can also be used to help analyze the distribution of consequences associated with potential timber harvest changes in one or more counties. For example, what are likely wage and employment effects

Table 9. --Annual employment and wages (1975 dollars) in Montana's timber-using industry[a] by county or county aggregation, 1970 and 1975[b]

County or Aggregation	1970 Employment	1970 Wages	1975 Employment	1975 Wages
Beaverhead	35.8	$196,681.70	77.2	$713,883.35
Broadwater	56.4	420,700.88	145.9	1,193,739.16
Carter	0.0	0.00	0.0	0.00
Dawson	0.0	0.00	0.0	0.00
Fallon	0.0	0.00	0.0	0.00
Fergus	16.6	60,229.67	91.5	516,315.46
Flathead	1,761.5	18,758,365.87	2,029.7	23,619,530.72
Gallatin	346.6	3,057,652.43	428.6	3,978,635.53
Golden Valley	0.0	0.00	0.0	0.00
Granite	108.8	796,923.58	85.8	697,236.54
Jefferson	11.7	50,973.76	12.8	78,938.40
Lake	290.2	2,699,228.87	284.7	2,092,159.58
Lewis and Clark	76.2	487,769.10	55.9	302,770.62
Liberty	0.0	0.00	0.0	0.00
Lincoln	1,576.8	17,864,732.30	1,744.4	18,704,912.99
Meagher	56.1	471,578.96	29.8	958,049.21
Mineral	253.0	2,420,830.30	367.4	3,828,482.46
Missoula	2,634.8	30,313,674.75	2,477.3	29,518,621.34
Musselshell	12.3	82,100.49	18.2	247,796.76
Park	93.4	678,687.53	202.0	1,735,449.05
Powder River	0.0	0.00	0.0	0.00
Powell	174.3	1,570,292.75	32.7	283,777.84
Prairie	0.0	0.00	0.0	0.00
Ravalli	368.7	3,301,462.16	347.7	3,012,185.95
Sanders	441.0	4,298,469.60	523.6	5,265,059.33
Treasure	0.0	0.00	0.0	0.00
Wibaux	0.0	0.00	0.0	0.00
Northern	64.2	619,274.78	31.2	261,352.74
Southeastern	149.7	1,251,398.20	212.1	2,142,778.38
Southwestern	62.1	518,727.16	50.1	556,081.34
Central	32.8	271,603.24	60.4	767,542.45
TOTAL[c]	8,623.0	$90,191,358.08	9,309.1	$100,475,299.23

[a]Timber-using industry consists of firms classified in SIC 24 and 26.

[b]County aggregates are as follows: Northern--Glacier, Toole, Pondera, Chouteau, Hill, Blaine, Phillips, Petroleum, Garfield, Valley, Daniels, Sheridan, Roosevelt, McCone, Richland; Southeastern--Big Horn, Carbon, Custer, Rosebud, Stillwater, Sweet Grass, Yellowstone; Southwestern--Deer Lodge, Silverbow, Madison; Central--Teton, Cascade, Judith Basin, Wheatland.

[c]County and aggregate totals are not identical to unpublished source data. This is because wages and employment in the "multicounty firm" category were apportioned to counties and aggregates on the basis of their relative size.

Source: Montana Employment Security Division, 1978.

Table 10.--Employment and wage consumption ratios for Montana's timber-using industry, by destination county or county aggregation, 1970 and 1975

County or County Aggregation	Employment per MMBF Consumed 1975	1970-75 % Chg.	Wages per MMBF Consumed 1975	1970-75 % Chg.	1975 Wages Paid Per Employee
Beaverhead	7.91	74.2	$73,134	193.3	$9,245
Broadwater	6.83	15.2	55,864	26.3	8,179
Carter	0.00	0.0	0	0.0	0
Dawson	0.00	0.0	0	0.0	0
Fallon	0.00	0.0	0	0.0	0
Fergus	13.77	-30.2	77,680	8.4	5,641
Flathead	10.32	26.9	120,044	38.7	11,632
Gallatin	14.01	23.9	130,009	30.2	9,280
Golden Valley	0.00	0.0	0	0.0	0
Granite	13.57	-35.4	110,287	-28.5	8,127
Jefferson	24.60	-41.6	151,717	-17.3	6,167
Lake	5.95	34.0	43,715	5.8	7,347
Lewis and Clark	8.86	4.5	47,982	-11.6	5,416
Liberty	0.00	0.0	0	0.0	0
Lincoln	10.31	46.9	110,515	38.9	10,719
Meagher	1.98	-40.4	63,760	128.7	32,202
Mineral	7.19	28.2	74,925	39.5	10,421
Missoula	7.23	-16.9	86,177	-13.9	11,919
Musselshell	1.85	-90.8	25,254	-81.2	13,651
Park	18.95	145.5	162,821	190.1	8,592
Powder River	0.00	0.0	0	0.0	0
Powell	2.42	-42.6	21,034	-44.6	8,692
Prairie	0.00	0.0	0	0.0	0
Ravalli	10.25	23.9	88,761	19.8	8,660
Sanders	8.01	59.2	80,552	64.4	10,056
Treasure	0.00	0.0	0	0.0	0
Wibaux	0.00	0.0	0	0.0	0
Northern	232.66	1,458.3	1,948,939	1,253.6	8,377
Southeastern	118.54	316.1	1,197,551	402.8	10,102
Southwestern	11.88	-17.4	131,857	9.8	11,099
Central	48.82	117.9	620,437	234.0	12,709
TOTAL	8.77	18.7	$94,616	68.1	$10,789

Table 11—Montana timber harvest-employment multipliers, by county of origin and destination, 1975.

County of Destination	Beaverhead	Broadwater	Carter	Dawson	Fallon	Fergus	Flathead	Gallatin	Golden Valley	Granite	Jefferson	Lake	Lewis and Clark	Liberty
Beaverhead	6.23	--	--	--	--	--	--	--	--	--	--	--	--	--
Broadwater	--	5.80	--	--	--	--	--	--	--	--	5.28	--	.56	--
Carter	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dawson	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fallon	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fergus	--	--	--	--	--	6.20	--	--	--	--	--	--	.14	--
Flathead	--	.08	--	--	--	.48	6.56	--	--	--	--	1.34	1.29	--
Gallatin	--	.36	--	--	--	--	--	12.89	--	--	.12	--	--	--
Golden Valley	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Granite	--	--	--	--	--	--	--	--	--	2.87	--	--	--	--
Jefferson	--	--	--	--	--	--	--	--	--	--	1.13	--	--	--
Lake	--	.10	--	--	--	--	.11	--	--	--	.05	2.07	--	--
Lewis and Clark	--	--	--	--	--	--	--	--	--	--	.29	--	2.53	--
Liberty	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lincoln	--	--	--	--	--	--	.17	--	--	--	--	--	--	--
Meagher	--	--	--	--	--	--	--	.06	--	--	.13	--	--	--
Mineral	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Missoula	--	--	--	--	--	--	2.37	--	--	4.66	--	3.52	2.56	--
Musselshell	--	--	--	--	--	.93	--	--	--	--	--	--	--	--
Park	--	--	--	--	--	--	--	.94	--	--	.18	--	--	--
Powder River	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Powell	--	--	--	--	--	--	--	--	--	.32	.02	--	.35	--
Prairie	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ravalli	2.18	1.03	--	--	--	--	--	--	--	--	--	--	--	--
Sanders	--	--	--	--	--	--	.01	--	--	--	--	.29	--	--
Treasure	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Wibaux	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Northern	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Southeastern	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Southwestern	--	--	--	--	--	--	--	--	--	.13	.59	--	--	--
Central	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Exports	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL	8.14	7.37	0.00	0.00	0.00	7.61	9.22	13.89	0.00	7.98	7.79	15.01	7.43	0.00

of a 25 million board feet reduction in timber harvest for Flathead and Missoula Counties for 1985? Data in Table 11, together with relationships presented previously, can be used to assess the timber harvest reduction, given stability in timber movement and in consumption ratios. Stability of timber movement is not an unreasonable assumption. But stability of consumption ratios is doubtful. How are these relationships changing over time? How can we best make judgments regarding the future? The answer to these questions requires a longer time perspective. We now turn to an analysis of aggregate timber use and industry data from 1962 to 1976.

CONSUMPTION RATIO ANALYSIS 1962 to 1976

The relationship between timber used and resulting employment and wage levels in the timber-using industry is fundamental to evaluating the economic consequences of change in timber management activity. Some of these data (1970 and 1975) have already been presented for Montana counties. But since resource analysts are often interested in future implications, an analysis of consumption ratio changes over time must be developed. Because county-level data over time are unavailable, state-level data must be used to assess likely changes in consumption ratios. This analysis assumes that the pattern of change at the county level is reflected by the state in total. The following will develop an analysis of these ratios for Montana during the 1962-1976 time period. This will be accomplished by first discussing timber use in Montana and then presenting data on associated levels of employment and wages in the timber-using industry. Consumption ratios calculated from these data will then be presented along with an analysis of their change over time.

Timber Used—Harvest, Imports and Exports

Harvest of timber from lands in Montana has remained

County of Origin																	
Lincoln	Meagher	Mineral	Missoula	Musselshell	Park	Powder River	Powell	Prairie	Ravalli	Sanders	Treasure	Wibaux	Northern	Southeastern	Southwestern	Central	Imports
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.32	--	--
--	.68	--	--	--	--	--	.16	--	--	--	--	--	.10	--	.01	.14	--
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--	--	--	--	1.29	--	--	--	--
2.14	.02	--	.04	--	.06	--	--	--	--	.75	--	--	8.35	--	--	--	--
--	--	--	--	--	3.13	--	.13	--	.01	--	--	--	--	--	3.75	--	.80
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	.27	--	--	--	--	--	--	--	.55	--	--
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
--	--	--	.83	--	.01	--	--	--	--	.53	--	--	--	--	--	--	--
--	--	--	--	--	--	--	.01	--	--	--	--	--	--	--	--	2.44	--
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
6.55	--	--	--	--	--	--	--	--	--	.28	--	--	--	--	--	--	2.09
--	1.50	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.95	--
--	--	3.40	.02	--	--	--	--	--	--	.24	--	--	--	--	--	--	3.27
.70	.57	3.09	6.10	--	--	--	6.40	--	2.18	2.24	--	--	--	--	--	--	.11
--	--	--	--	1.83	--	--	--	--	--	--	--	--	--	--	--	--	--
--	1.19	--	--	--	14.56	--	--	--	--	--	--	--	--	.33	--	--	--
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
--	--	--	.01	--	--	--	.13	--	--	--	--	--	--	--	.83	--	--
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
--	--	--	.03	--	--	--	--	--	7.15	--	--	--	--	--	--	--	1.94
.09	--	.80	.04	--	--	--	--	--	--	3.45	--	--	--	--	--	--	.65
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--	--	--	--	19.14	--	--	--	--
--	--	--	--	1.43	--	105.23	--	--	--	--	--	--	--	73.01	--	--	--
--	--	--	--	--	--	--	.12	--	--	--	--	--	--	--	2.18	--	--
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	11.10	--
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
9.48	3.96	7.29	7.07	3.26	17.76	105.23	7.22	0.00	9.34	7.49	0.00	0.00	28.88	73.34	8.64	14.63	8.86

relatively stable over the period 1962-1976.[7] In fact, the difference between the largest timber cut (1968) and the smallest (1975) was just 25 percent. Table 12 shows that annual change in harvest was quite modest, averaging about 0.67 percent annually. Our data indicate a reasonably steady increase in timber harvest to the end of the 1960's and a relatively steady decrease during the 1970's.

Table 12 also shows that timber harvest from national forest and private lands accounted for nearly all of the Montana harvest. Over the 1962-1976 period, the average annual harvest was 1197.5 million board feet. Timber cut from national forest and private lands averaged 1096.5 annually, about 92 percent of the total. Timber cut from national forests has averaged 654.3 million board feet annually while timber cut from private lands averaged 442.2 million during the 1962-1976 period. These levels correspond to 55 percent and 37 percent of the total 1962-1976 timber cut.

While national forest timber cut has dominated the aggregate Montana cut, the degree of dominance has been decreasing over time. Figure 4 shows the general inverse relationship between cut on national forests and cut on private lands. While no cause-effect relationship is implied, a strong negative correlation is obvious. On a percentage basis, when cut on one increases, cut on the other decreases. 1969 seems to be a pivotal year. Prior to 1969, the percent of Montana timber cut from national forests generally increased while cut from private lands generally decreased. The reverse was true after 1969 such that, since 1974, cut from private land has exceeded that from national forests. The percent of total timber cut from all other ownership has

[7]Data on Montana timber harvest have always been incomplete and difficult to compare. Prior to this study, Forest Service data (1977) were available beginning with the 1969 Montana timber harvest. No comparable data were available for earlier years. This study generated equivalent harvest data for 1968, back to 1962, the first year for which accurate records exist. Additionally, several discrepancies found in post-1969 data were corrected. These data represent the most comprehensive and consistent statement of Montana timber harvest. They are consistent in that all harvest levels are based on removals from the land base, as opposed to timber receipts at processing plants.

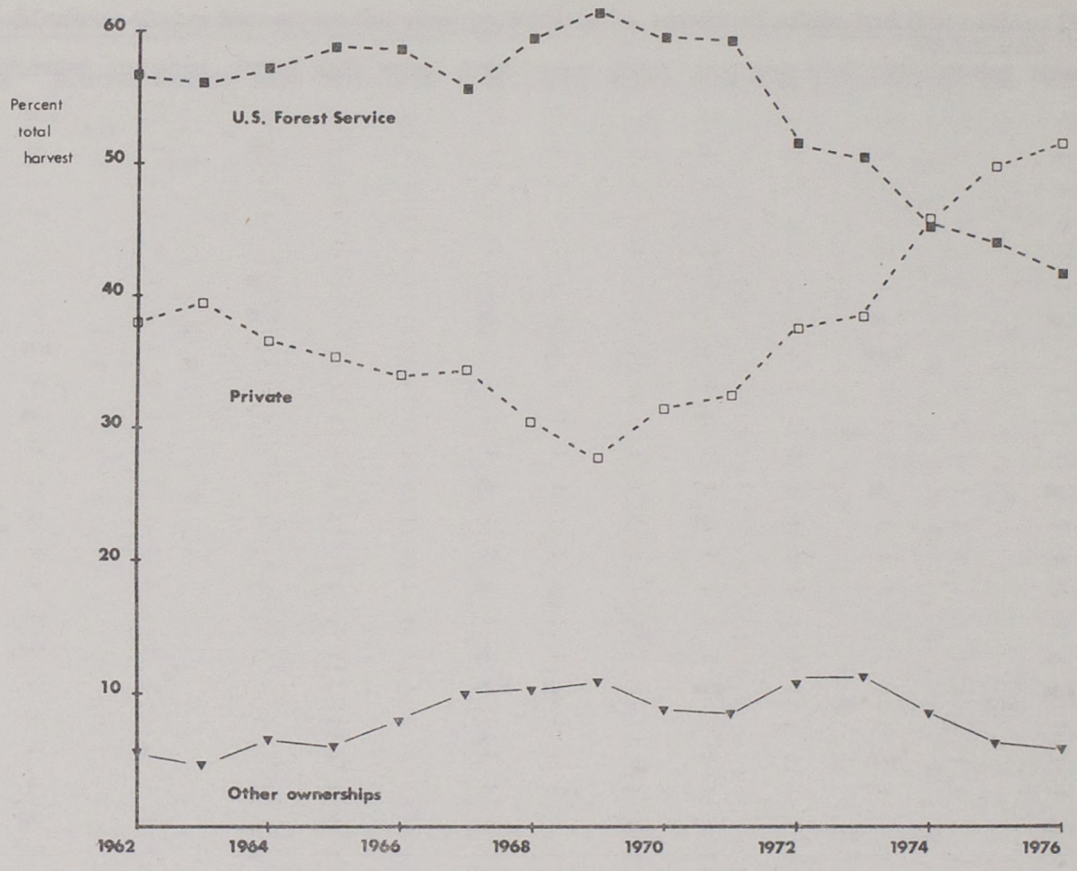

FIGURE 4. Percent distribution of Montana timber harvest, by ownership, 1962-1976.

remained relatively constant, averaging about eight percent annually.

Not all of the timber harvested is used in Montana (some timber is exported), and Montana uses timber from other sources (some timber is imported). The major difficulty encountered when quantifying timber imports and exports is the absence of data. Import and export data for the period 1962-1976 do not exist. Therefore, final determination of these levels is a judgment based on isolated bits of information. Consider timber export first.

Characteristic	1970	1975	Combined
Total Exports	30.2 MMBF	16.9 MMBF	47.1 MMBF
... % Harvest	2.77%	1.68%	2.25%
National Forest	23.1 MMBF	13.3 MMBF	36.4 MMBF
... % Exports	76.5%	78.7%	77.3%
Idaho Destination	29.2 MMBF	15.8 MMBF	45.0 MMBF
... % Exports	96.7%	93.5%	95.5%

The judgment on timber exports from Montana was based on three information sources. The first and most influential source was the present study. The listing above shows that Montana timber exports averaged about 2.25 percent of the harvest level for 1970 and 1975 combined, were generally sent to Idaho, and were generally exported from national forest harvests. The second source of information was a study that determined the source of roundwood for the Idaho timber-using industry in 1973 (Godfrey and Schuster, 1977). This study indicated that about 1.3 percent of the 1.944 billion board feet consumed by the Idaho industry came from Montana. This converts to 25.3 million board feet. If 95.5 percent of Montana exports went to Idaho, then about 47.3 million board feet were delivered to Idaho during these two years, or an average of 23.7 million board feet. Assume this average represents CY 1970. Further, if national forest exports account for 77.3 percent of the total, then 30.6 million board feet of timber were exported from Montana in 1970. This derived total compares to the 30.2 million board feet total measured in this study–quite a good approximation. Based on data available, the following levels of timber export were identified:

Year	Export (MMBF)	Source
1970	30.2	Present Study
1970	30.6	USFS, c1973 (not used)
1973	26.4	Godfrey and Schuster, 1977
1975	16.9	Present Study

These represent all known timber export data. Based on these data, an arithmetic average of 24.5 million board feet (excluding Forest Service data) was calculated. Since data for each year (1962-1976) do not exist, all Montana timber harvests were adjusted by 24.5 million board feet each year to reflect timber exports.

Now for imports. The data base is again very incomplete, consisting of three sources. An analysis of Forest Service data indicated that about 73.0 million board feet of timber were imported to Montana in 1970 (USFS, c1973) and another analysis indicated that about 58.1 million board feet were imported during 1976 (BBER, 1977). This latter source

additionally indicated that all imports came from Idaho. The third source of data indicated that about 42.2 million board feet of Idaho's 1972 timber cut was shipped to Montana (Koss, 1975). These three sources represent all of the usable timber import data:

Year	Import (MMBF)	Source
1970	73.0	USFS, c1973
1972	42.2	Koss, 1975
1976	58.1	BBER, 1977

Again, since timber import data for each year during 1962-1976 were not available, the arithmetic mean of 57.7 million board feet was calculated and used to represent the average annual level of timber imports to Montana over the 1962-1976 period.

Wage and employment levels in Montana's timber-using industry are based largely on timber used. The amount of timber used is based on timber harvest levels shown in Table 12. To these, an average annual import level of 57.7 million board feet was added and an average annual export level of 24.5 million board feet was subtracted. On balance, Montana seems to import about 33.2 million board feet (= 57.7 - 24.5) of timber more than it exports.

Employment and Wages Paid

Employment and wages in Montana's timber-using industry have increased markedly over the past decade and a half. Table 13 shows that 1973 represented the year with the largest number of employees and 1976 represented the highest level of wages paid during the 1960-1967 period. The year to year increase in total wages has been very steady, averaging a compound growth rate of almost 4.5 percent annually when measured in constant 1975 dollars. Changes in employment have been modest up-and-down fluctuations year to year, while the total level of employment has increased at a 1.5 percent annual compound rate and the level of wages per employee has increased from about $8,339 in 1960 to about $13,143 in 1976, an approximate 3.0 percent annual compound growth rate.

Consumption Ratios and Time

Data already presented on the volume of timber used, together with employment and wages in the timber-using industry constitute the information needed to calculate consumption ratios for 1962 to 1976. The purpose of this section is to evaluate the change in consumption ratios over time. Two ratios will be considered: the employment-consumption ratio and the wage-consumption ratio.

An employment-consumption ratio is calculated by dividing an employment level by the volume of timber used in units of million board feet. Figure 5 shows the annual employment-consumption ratios for Montana's timber-using industry during the period 1962-1976. During this period, the following characteristics were found:

Mean: 7.6 employees/MMBF
Median: 7.2
Range: 6.6-9.2
Standard Deviation: 0.93

Table 12.--Montana timber harvest, by ownership class, 1962-1976

Year	U.S. Forest Service	Bureau of Land Management	Bureau of Indian Affairs	State of Montana	Private	Total
			---Million Board Feet---			
1962	631.9	7.2	23.1	30.1	424.6	1,116.9
1963	726.2	9.9	22.3	25.2	509.6	1,293.2
1964	722.1	12.5	37.7	28.0	459.2	1,259.5
1965	774.6	19.9	30.0	28.7	463.0	1,315.4
1966	785.7	19.4	57.1	23.3	453.7	1,339.2
1967	658.7	13.5	61.9	40.3	403.2	1,177.6
1968	796.9	19.4	83.9	34.0	405.2	1,339.4
1969	799.7	15.0	78.8	46.7	362.2	1,302.4
1970	651.7	15.8	53.5	28.2	344.3	1,093.5
1971	738.6	5.0	76.0	21.8	402.1	1,243.5
1972	558.0	4.3	82.8	30.4	406.6	1,082.1
1973	564.1	2.6	98.0	23.3	429.4	1,117.4
1974	495.3	3.3	82.7	10.3	499.4	1,082.1
1975	442.0	6.7	44.2	9.8	501.2	1,003.9
1976	470.4	4.5	44.1	17.3	569.9	1,106.2

Source: 1969, 1971-1974, and 1976--U.S. Forest Service, 1977.

Table 13. Employment and wages paid in Montana's timber-using industry, 1960-1976[a]

YEAR	Employment	Wages Paid	
		Current Dollars	1975 Dollars[b]
		(million dollars)	
1960	7,400	35	62
1961	7,700	37	65
1962	8,200	42	72
1963	8,800	45	76
1964	8,700	48	81
1965	8,900	52	85
1966	9,200	56	89
1967	9,100	58	90
1968	9,400	64	96
1969	9,300	67	96
1970	8,600	66	90
1971	9,200	75	98
1972	9,700	79	100
1973	10,600	92	111
1974	9,900	94	102
1975	9,300	100	100
1976	9,100	125	120

[a]Timber-using industry includes SIC 24 and 26.

[b]Basis: GNP deflator for personal consumption items.

Sources:

Montana Employment Security Division, 1978.

Bureau of Labor Statistics, 1978.

Employment-consumption ratios were calculated on the basis of employment levels shown in Table 13 and the timber harvest levels shown in Table 12 (adjusted annually by 33.2 million board feet for net timber imports).

Figure 5 shows that employment-consumption ratios are not constant over time. Except for 1971-1972, modest annual change is shown. But the real purpose in analyzing these ratios is to arrive at a judgment as to how the ratios are likely to change over time, beyond 1976. The basis for this judgment lies in the functional relationship between employment-consumption ratios and time. This relationship was estimated by fitting these data to several curve forms. The following models were evaluated:

1. $E/H = a + bT$
2. $E/H = a + bT$ ... lagged one year

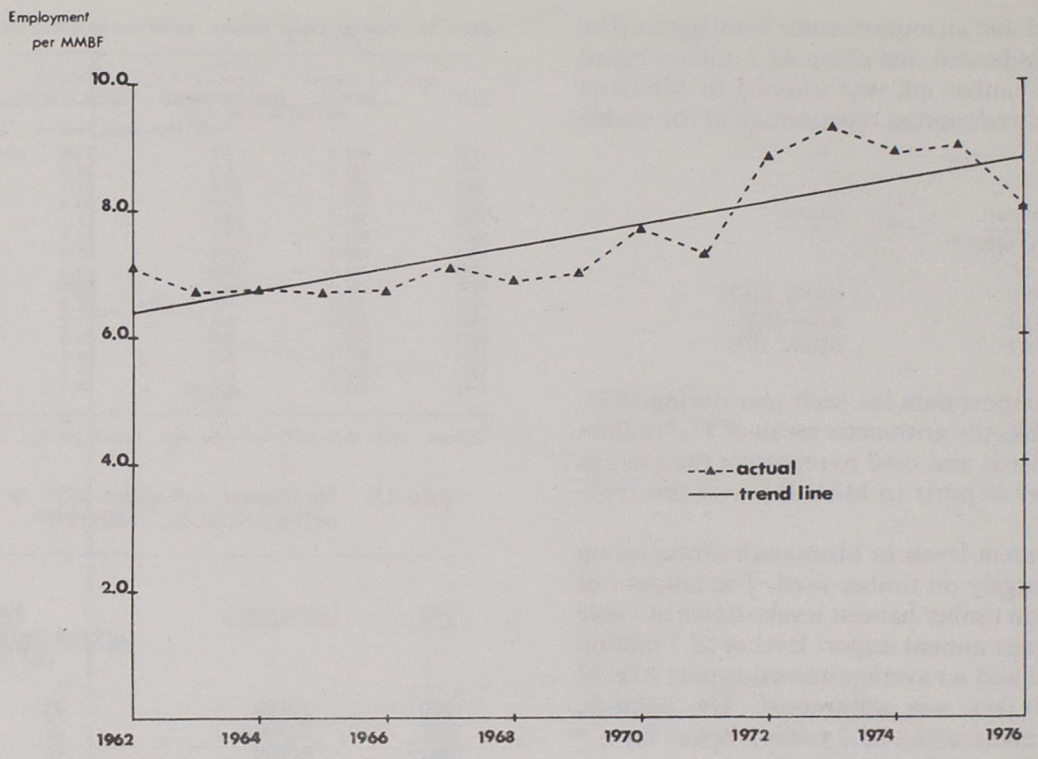

FIGURE 5. Employment consumption ratios for Montana, 1962-1976.

3. $E/H = a + b\,(1/T)$
4. $E/H = a + b\,(1/T)$ ... lagged one year
5. $E/H = a + b\,(\text{Log } T)$
6. $E/H = a + b\,(\text{Log } T)$ ... lagged one year

Selection of the most appropriate curve form was based on statistical significance of the coefficient and the magnitude of the coefficient of multiple determination (R^2). On these bases, model No. 1 above represented the best fit and model No. 2 was next. Characteristics of this model are:

$E/H = 6.38 + 0.168(T)$
$R^2 = 0.65$
$F = 24.18$

where: E/H = Employees/million board feet
T = Year - 1961.9

Figure 5 shows the linear regression line of predicted employment-consumption ratios. There is a clear upward trend to this line.[8]

[8]An upward-sloping trend line is not consistent with conventional thinking in forestry. Indeed, the major work of Wall and Oswald (1975) shows opposite trends for the West Coast. This study does not reveal why Montana data differ. However, two major explanations seem reasonable. First, the influence of organized labor unions in Montana's timber-using industry has been expanding. To the extend that labor contracts make labor force reductions more difficult, decreases in timber use will be associated with relatively large employment consumption ratios. The second explanation concerns roundwood utilization. Technological change, including increased integration of the industry, appears to have resulted in more complete utilization of harvested roundwood. Increased use of residues and small-log sawmills are but two examples. The once unused waste materials are now being processed, calling for additional workers. Under this circumstance, even a constant level of timber used would give rise to increases in the employment consumption ratio. The technological changes taking place in Montana may simply be lagging behind similar changes that occurred earlier on the West Coast.

How should the selected equation be used? The answer is straighforward on one hand. On the other hand, judgment is needed. On a straightforward basis, if an estimate of E/H for 1980 is desired, simply do as follows:

1. $T = (1980\text{-}1961.9)$
   $= 18.1$
2. $\widehat{E/H} = 6.38 + 0.168\,(T)$
   $= 6.38 + 0.168\,(18.1)$
   $= 6.38 + 3.04$
3. $\widehat{E/H}\,(1980) = 9.4$

Now for the judgment part. The actual employment-consumption ratios plotted in Figure 5 show both a general upward trend and a major increase in these ratios for 1971, 1972, and 1973. Study data do not explain the reason for these large ratios. Nor do they indicate whether or not these large ratios will be more typical in the future. But the larger ratios exaggerate the slope of the trend line. A conservative interpretation would probably be appropriate. That is, $(E/H) = 9.4$ should be interpreted as a maximum employment consumption ratio. How small is it likely to be? Probably the best estimate of this level is given by the lower confidence interval for the 1980 estimated employment-consumption ratio. The 95 percent level confidence interval for any estimated ratio is:

$$(E/H) \pm 1.233\sqrt{1.067 + \frac{(T - 7.1)^2}{280}}$$

where: T = Year - 1961.9

$(\widehat{E/H})$ = Estimated employment-consumption ratio for target year.

$\therefore$ if ... $(\widehat{E/H}) = 9.4$ and $T = 18.1$

then ... $9.4 \pm 1.2 = 10.6$ to 8.2

If the lower confidence limit for the estimated employment-consumption ratio were accepted as the lowest likely ratio, the actual 1980 ratio would probably lie between 9.4 and 8.2 employees per million board feet of timber consumed.

Data presented in the previous section dealt with both employment and wages in Montana's timber-using industry. Accordingly, an analysis of wage-consumption ratios, similar to that for employment-consumption ratios, can be developed. Data concerning timber used are the same as those described earlier. Data on wages paid are those shown in Table 13.

Wage-consumption ratios for Montana's timber-using industry are calculated by dividing total wages paid by the level of timber used. Figure 6 shows the results of a series of such division, over time. All expressed on the basis of constant (1975) dollars, a clear upward trend is revealed. During the 1962-1976 period, the following characteristics were found:

Mean: $77,527.2/MMBF
Median: 72,177.3
Range: 57,600 - 104.968
Standard Deviation: 14,836.7

As before with employment-consumption ratios, these data were fitted to several statistical models. Also, as before,the simple regression with time (non-lagged) was the "best-fit" model and the one-year lagged version was the next best, based on R^2. Characteristics of this model are:

$W/H = 54941.6 + 3181.6\ (T)$
$R^2 = 0.92$
$F = 148.3$

where: W/H = Wages paid/million board feet
T = Year - 1961.9

Application of the expression above should be as before. If an estimate of W/H for 1980 were desired, simply proceed as follows:

1. $T = (1980 - 1961.9)$
   $= 18.1$

2. $W/H = 54941.6 + 3181.6\ (T)$
   $= 54941.6 + 3181.6\ (18.1)$
   $= 54941.6 + 57587$
3. $W/H\ (1980) = 112,529$

The 95 percent level confidence interval for this estimated ratio is:

$$(W/H) \pm 9442.7\sqrt{1.067 + \frac{(T - 7.1)^2}{280}}$$

where: T = Year - 1961.9

$(\widehat{W/H})$ = Estimated wage-consumption ratio for target year.

if ... $(\widehat{W/H}) = \$112,529$ and $T = 18.1$

then ... $\$112,529 \pm 11,558 = \$100,971$ to $\$124,087$

The procedure used with the employment-consumption ratio earlier was that the estimated ratio served as the likely upper bound and the lower confidence interval served as the lower bound. Accordingly, the actual wage-consumption ratio for 1980 would likely lie between $100,970.7 and $112,528.6 per million board feet of timber consumed.

Estimation of consumption ratios, for both employment and wages, need not be expressed solely as a function of time. More complicated relationships can be developed. Foremost among these is one involving both time and timber used. Several multiple linear regression models were tested. Again the non-lagged linear form was found to be most satisfac-

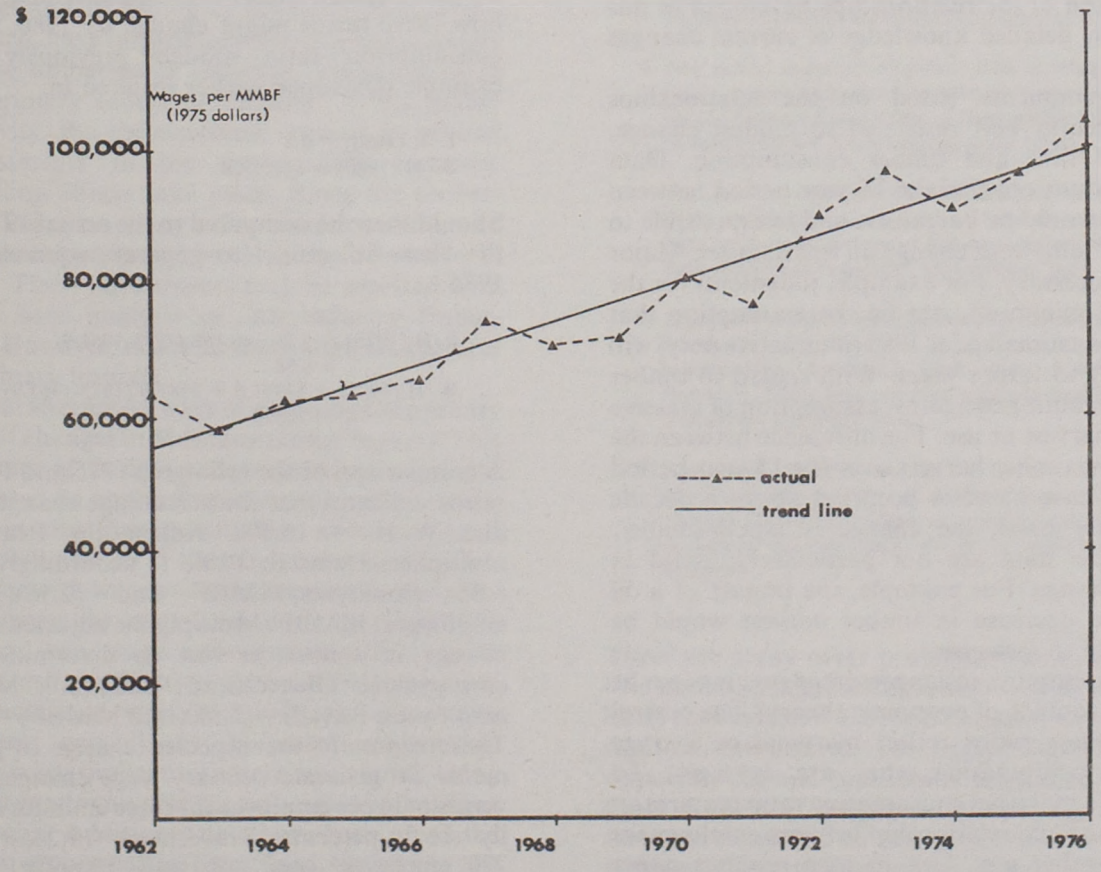

FIGURE 6. Wage consumption ratios for Montana, 1962-1976.

tory. Characteristics of these models are:

$E/H = 12.68 + 0.095(T) - 0.005(H)$
$R^2 = 0.85$
$F = 33.31$

where: E/H = Employees/million board feet
T = Year - 1961.9
H = Million board feet timber consumed

$W/H = 99{,}920.0 - 2660.0(T) - 33.7(H)$
$R^2 = 0.96$
$F = 140.12$

where: W/H = Wages paid/million board feet
T = Year - 1961.9
H = Million board feet timber consumed

Application of these expressions not only requires identification of a target year, but also an estimate of timber consumed by Montana's timber-using industry. For example, consider the case for 1980 under the assumption of 1000 million board feet of timber consumed. Results are:

$E/H = 12.68 + 0.095\ (1980 - 1961.9) - 0.005\ (1000)$
$= 9.4$

$W/H = 99920.0 + 2660.0\ (1980 - 1961.9) - 33.7\ (1000)$
$= \$114{,}366$

These estimates are very close to previous estimates for 1980, identical in the case of employment and one percent higher for wages.

The relationships discussed above should be used cautiously. Montana's timber-using industry is constantly changing. So are technologies and management-labor relationships. These things will continue to change. Judgments on future levels of consumption ratios should be based on application of the relationships developed in this paper, tempered by detailed knowledge of current changes within the industry.

Furthermore, judgments based on the relationships presented are probably best restricted to modest change, both in terms of time and timber consumption. Data available for this study covered the 15-year period between 1962 and 1976. It would be unrealistic and irresponsible to base judgments of long-term change on this data set. Major assumptions are necessary. For example, judgments for the year 2000 may, at minimum, rest on the assumption that consumption ratios estimated for 1985 (illustrative only) will stabilize and apply to future years. With regard to timber used, the reader is cautioned against assumption of massive change in timber harvest or use. The difference between the largest and smallest timber harvest over the 15-year period was 25 percent. Those harvests occurred about a decade apart. On a yearly basis, the change is much smaller. Consequently, these data are not particularly useful in assessing major change. For example, the impact of a 50 percent immediate decrease in timber harvest would be virtually impossible to measure.

How should consumption ratios presented in this paper be interpreted in the context of economic theory? The central issue is whether these ratios reflect marginal or average relationships. By computation, they are averages. To correctly calculate a marginal consumption ratio requires an estimate of the functional relationship between employment (or wages) and timber use. This in turn requires either stability of the function over time or numerous data observations for one point in time. Neither of these conditions hold. The series of consumption ratios estimated in this paper amount to points on a series of functions, one function for each year. Since these functions cannot be estimated, an analytical distinction between marginal and average ratios cannot be made. Under these circumstances, a linear relationship between employment (or wages) and modest variation in timber use seems most plausible. Average and marginal functions derived from a linear function are identical. Therefore, the ratios presented are both the average and marginal consumption ratios.

Application of the data and relationships can be illustrated with an example based on some previous examples. Suppose timber harvest in Beaverhead County were to be increased by 1.0 million board feet in 1980 and that all other timber harvests were to remain constant. Table 1 shows that this harvest would come from a county representing less than one percent of both the commercial forest in Montana or the 1975 timber harvest. Figure 3 indicates that about 78.8 percent of the change in harvest would remain in Beaverhead, 21.2 percent would be delivered to Ravalli County, and none would be exported from the state. Table 5 indicates that Beaverhead County is largely self-sufficient and plays a minor role either as a sink or source of timber in Montana. Table 11 shows that each million board feet of timber harvest in Beaverhead County was associated with employment levels of 6.23 in Beaverhead and 2.18 in Ravalli Counties in 1975. But we are interested in 1980. How will these relationships change over time? We will assume that changes in these relationships will follow the expected changes in Montana's wage-consumption and employment-consumption ratios. Figure 5 shows that Montana's 1975 employment-consumption ratio was about 8.0 and Figure 6 shows the wage-consumption ratio. To find how these ratios might change by 1980, use the "best-fit" consumption ratio models previously discussed. The example developed earlier resulted in:

$E/H\ (1980) = 9.4$
$W/H\ (1980) = \$112{,}529$

Should these be compared to the actual 1975 ratios? No. Use the "best-fit" model to generate equivalent estimates for 1975:

$E/H\ (1975) = 6.38 + 0.168\ (1975\text{-}1961.9)$
$= 8.58$
$W/H\ (1975) = 54941.6 + 3181.6\ (1975\text{-}1961.9)$
$= 96620$

A comparison of the estimated 1975 and 1980 consumption ratios indicates that the percentage change for $E/H = 9.6\%$ and $W/H = 16.5\%$. Adjust the Beaverhead County multipliers found in Table 11 accordingly: $(6.23)(1.096) = 6.83$ employees/MMBF and $(2.18)(1.096) = 2.39$ employees/MMBF. Multiply the adjusted multipliers by the change in timber harvest to determine the change in employment: Beaverhead—(6.83)(1.0 MMBF) = 6.83 employees, Ravalli—(2.39)(1.0 MMBF) = 2.39 employees. These represent the expected change in primary employment. To generate primary wage change, adjust the 1975 wages paid per employee for these counties found in Table 10 by 16.5 percent: Beaverhead—(9,245)(1.165) = $10,770/employee and Ravalli—(8,660)(1.165) = $10,089/employee. Multiplying these levels by the change in

employment results in $73,559 (= 10,770 x 6.83) for Beaverhead and $24,113 (= 10,089 x 2.39) for Ravalli County as estimates of wage changes in timber-using industry. Now, recognize that these estimates apply only to workers covered by unemployment or workman's compensation insurance. An adjustment (say an increase of 6.4 percent) along the lines previously discussed would find 9.81 [= 1.064(6.83 + 2.39)] employees affected in the timber-using industry.

The final issue in using these data concerns time lag. Examination of historical data suggests that it is imprudent to posit an immediate and predictable response to a specific change. Consider timber harvest and employment. Between 1969 and 1970, timber harvests dropped by about one-fourth of a billion board feet. Employment also decreased. A similar harvest decline occurred between 1971 and 1972, but employment *increased.* There are simply too many unanalyzed factors determining specific, year-to-year response to base judgments on time and timber harvest only. It would therefore seem that the analysis presented in this section would be most appropriately applied to non-massive timber harvest adjustments that may occur over the mid-term (say to 15 years) with the explicit understanding that adjustments on a year-to-year basis cannot be accurately determined with these methods.

CONCLUDING REMARKS AND ILLUSTRATION

Adjustments in timber management often involve a change in the level and/or timing of timber harvest. These adjustments, in turn, have implications for employment and wage levels in the timber-using industry. These are often referred to as "primary economic impacts" of the timber management activity. But the economic impacts go beyond immediate adjustments in the timber-using industry. Spillover or rippling effects take place. Since the timber-using industry is linked to many other sectors of an area's economy, employment and wage levels in these sectors will also be adjusted. These adjustments may be assessed with either economic base analysis or interindustry (input-output) analysis. However, either of these analyses requires knowledge of primary impacts.

There are several alternative ways of assessing the primary economic effects of changes in Montana timber harvest. This paper presented some of the data and relationships needed to implement one based on application of consumption ratios. Data presented in this paper included: a) county-level information on 1970 and 1975 timber harvest and timber movement together with wage and employment levels in the timber-using industry; b) state-level data on 1962-1976 timber harvest and use, wage and employment levels in Montana's timber-using industry, together with an analysis of how employment and wage-consumption ratios have changed over time; and c) the integrated relationship between timber harvest, timber movement, and timber-using industry wage and employment levels associated with timber deliveries to counties. Additional data have been presented on the distribution of commercial forest land, timber harvest by major organization, and timber imports and exports.

But primary employment and wage changes represent only the initial round of change. Analysis of aggregate change usually involves economic base or input-output multipliers, explanation of which is beyond the scope of this paper (see Polzin, c1977). When a multiplier relevant to this situation is identified, it would be appropriate to multiply primary wage and employment changes for Beaverhead and Ravalli Counties by the multiplier, to estimate aggregate change. Earlier discussion focuses on confidence intervals associated with estimated consumption ratios. Results of this type of analysis should be considered in any estimate of wage and employment change. Implementation of confidence intervals is accomplished by the steps just described.

The data and relationships presented in this paper are intended as tools to assess likely wage and employment consequences of changes in timber harvest. These data, relationships, and analytical methods are compatible with common evaluation practices used in Montana and elsewhere. Proper application of these practices compels the analyst to keep in mind several important issues:

1. An expected change in timber management activity must be translated into a change in timber used by industry. Calculated change in timber harvest need not be directly reflected in actual harvest. Likely response from other timber sources (including out-of-state) must also be assessed.

2. All analyses should deal only with change. Linking change in timber use to change in employment or wages is critical. A "before and after" or a "with and without" analysis seems appropriate.

3. Analysts must consider the implication of the assumptions of linearity and stability of relationships. Use of consumption ratios, harvest-employment multipliers, together with economic base multipliers is premised on direct and proportional adjustments. These relationships are typically assumed to remain stable over time.

4. Any model requiring empirical data is subject to error. Errors in measurement and errors in estimation are to be expected. Results should reflect an awareness of these ambiguities and interpretation of results should be conducted accordingly.

5. The quantity and quality of the data base has major implications as to the nature of analysis results. The analyst should understand data base limitations. Foremost among these are wage and employment data relation to "covered" employment only.

6. Analyses should be as consistent as possible with the data base upon which they rest. Analyses of massive change should not rest on relationships developed from data showing modest change. Similarly, a data base covering a decade should not be used to assess a situation a century away.

7. Assessment models should be understood as indicative, not predictive. The economy of the forest industry is always adjusting to change. Displaced workers may shift to other lines of work. Other economic changes may off-set or compound a change being analyzed.

There are many other problems that could be highlighted. The above seem most important. One point should be clear: analytical methods are tools designed to assist evaluation of decision alternatives. The analyst should be aware of the opportunities and limitations associated with use of these tools. Hopefully, proper use of the data, relationships, and methods described in this paper will increase the responsiveness of forest management decisions to employment and wage considerations.

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Appendix

Table A1— Characteristics of State of Montana and private timber harvest in Montana, by county of destination, 1970 and 1975.

Destination County	State of Montana 1975 Timber Harvest Volume	State of Montana 1975 Timber Harvest Percent State	State of Montana Percent Change	Private 1975 Timber Harvest Volume	Private 1975 Timber Harvest Percent State	Private Percent Change
Beaverhead	0.0	0.00	0.00	0.0	0.00	0.00
Bighorn	0.0	0.00	0.00	0.0	0.00	0.00
Blaine	0.0	0.00	0.00	0.0	0.00	0.00
Broadwater	0.0	0.00	0.00	13,115.0	2.62	157.02
Carbon	0.0	0.00	0.00	80.0	0.02	999.99
Carter	0.0	0.00	0.00	0.0	0.00	0.00
Cascade	0.0	0.00	0.00	0.0	0.00	0.00
Couteau	0.0	0.00	0.00	48.5	0.01	999.99
Custer	0.0	0.00	0.00	175.0	0.03	999.99
Daniels	0.0	0.00	0.00	0.0	0.00	0.00
Dawson	0.0	0.00	0.00	0.0	0.00	0.00
Deer Lodge	0.0	0.00	0.00	239.4	0.05	3.01
Fallon	0.0	0.00	0.00	0.0	0.00	0.00
Fergus	0.0	0.00	0.00	6,117.7	1.22	999.99
Flathead	4,476.3	45.70	-9.02	51,948.9	10.36	-13.28
Gallatin	0.0	0.00	0.00	25,451.4	5.08	119.93
Garfield	0.0	0.00	-100.00	0.0	0.00	0.00
Glacier	0.0	0.00	0.00	0.0	0.00	0.00
Golden Valley	0.0	0.00	0.00	0.0	0.00	0.00
Granite	0.0	0.00	0.00	5,479.0	1.09	1,250.17
Hill	0.0	0.00	0.00	0.0	0.00	0.00
Jefferson	0.0	0.00	0.00	0.0	0.00	0.00
Judith Basin	0.0	0.00	0.00	201.6	0.04	999.99
Lake	467.3	4.77	-96.20	31,502.4	6.28	62.91
Lewis and Clark	0.0	0.00	0.00	4,783.0	0.95	-31.90
Liberty	0.0	0.00	0.00	0.0	0.00	0.00
Lincoln	3,160.6	32.27	-3.68	63,609.1	12.69	55.16
Madison	0.0	0.00	0.00	0.0	0.00	0.00
McCone	0.0	0.00	0.00	0.0	0.00	0.00
Meagher	0.0	0.00	0.00	2,531.0	0.50	99.86
Mineral	11.9	0.12	52.51	780.1	0.16	-19.77
Missoula	1,597.9	16.31	-67.45	243,724.9	48.62	64.80
Musselshell	0.0	0.00	-100.00	9,812.1	1.96	1,807.86
Park	0.0	0.00	0.00	7,008.1	1.40	96.85
Petroleum	0.0	0.00	0.00	0.0	0.00	0.00
Phillips	0.0	0.00	0.00	0.0	0.00	0.00
Pondera	0.0	0.00	0.00	0.0	0.00	0.00
Powder River	0.0	0.00	0.00	0.0	0.00	0.00
Powell	0.0	0.00	0.00	5,774.8	1.15	-74.35
Prairie	0.0	0.00	0.00	0.0	0.00	0.00
Ravalli	10.0	0.10	999.99	5,654.0	1.13	727.58
Richland	0.0	0.00	0.00	0.0	0.00	0.00
Roosevelt	0.0	0.00	0.00	0.0	0.00	0.00
Rosebud	0.0	0.00	0.00	0.0	0.00	30.79
Sanders	71.1	0.73	-15.46	20,010.0	3.99	0.00
Sheridan	0.0	0.00	0.00	0.0	0.00	0.00
Silverbow	0.0	0.00	0.00	0.0	0.00	999.99
Stillwater	0.0	0.00	0.00	98.3	0.02	0.00
Sweetgrass	0.0	0.00	0.00	0.0	0.00	0.00
Teton	0.0	0.00	0.00	0.0	0.00	0.00
Toole	0.0	0.00	0.00	0.0	0.00	0.00
Treasure	0.0	0.00	0.00	0.0	0.00	0.00
Valley	0.0	0.00	0.00	0.0	0.00	0.00
Wheatland	0.0	0.00	0.00	0.0	0.00	0.00
Wibaux	0.0	0.00	0.00	0.0	0.00	0.00
Yellowstone	0.0	0.00	0.00	69.9	.01	999.99
Exports	0.0	0.00	0.00	3,031.3	.60	-56.93
TOTAL	9,795.2	100.00	-65.29	501,245.5	100.00	46.11

Table A2—Characteristics of Bureau of Land Management timber harvest in Montana, by district and county of destination, 1970 and 1975.

Destination County	Billings			Dillon			Lewis			Malta		
	1975 Timber Volume (MMBF)	Harvest Percent	% Harvest Change 1970-75	1975 Timber Volume (MMBF)	Harvest Percent	% Harvest Change 1970-75	1975 Timber Volume (MMBF)	Harvest Percent	% Harvest Change 1970-75	1975 Timber Volume (MMBF)	Harvest Percent	% Harvest Change 1970-75
Beaverhead	0.00	.00	0.00	291.30	4.36	-87.58	0.00	.00	0.00	0.00	.00	0.00
Bighorn	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Blaine	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	8.00	.12	912.50
Broadwater	0.00	.00	0.00	32.00	.48	-84.76	0.00	.00	0.00	0.00	.00	0.00
Carbon	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Carter	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Cascade	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Chouteau	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Custer	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Daniels	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Dawson	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Deer Lodge	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Fallon	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Fergus	0.00	.00	0.00	0.00	.00	0.00	376.00	5.63	327.27	0.00	.00	0.00
Flathead	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Gallatin	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Garfield	0.00	.00	0.00	0.00	.00	0.00	9.00	.13	999.99	0.00	.00	0.00
Glacier	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Golden Valley	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Granite	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Hill	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Jefferson	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Judith Basin	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Lake	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Lewis and Clark	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Liberty	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Lincoln	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Madison	0.00	.00	0.00	65.30	.98	-35.98	0.00	.00	0.00	0.00	.00	0.00
McCone	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Meagher	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Mineral	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Missoula	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Musselshell	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Park	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Petroleum	0.00	.00	0.00	0.00	.00	0.00	5.00	.07	-28.57	0.00	.00	0.00
Phillips	0.00	.00	0.00	0.00	.00	0.00	5.00	.07	-89.13	32.50	.49	-29.04
Pondera	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Powell	0.00	.00	0.00	0.00	.00	-100.00	0.00	.00	0.00	0.00	.00	0.00
Prairie	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Ravalli	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Richland	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Roosevelt	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Rosebud	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Sanders	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Sheridan	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Silverbow	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Stillwater	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Sweet Grass	0.00	.00	0.00	0.00	.00	-100.00	0.00	.00	0.00	0.00	.00	0.00
Teton	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Toole	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Treasure	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Valley	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Wheatland	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Wibaux	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Yellowstone	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Exports	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
TOTAL	0.00	.00	0.00	388.60	5.82	-90.86	395.00	5.92	180.14	40.60	.61	-12.88

1975 Timber Harvest Volume Totals	Harvest Percent Totals	Percent Change Totals	Miles 1975 Timber Harvest Volume (MMBF)	Miles Harvest Percent	Miles % Harvest Change 1970-75	Missoula 1975 Timber Harvest Volume (MMBF)	Missoula Harvest Percent	Missoula % Harvest Change 1970-75
291.60	4.36	-87.58	0.00	.00	0.00	0.00	.00	0.00
0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
8.10	.12	912.50	0.00	.00	0.00	0.00	.00	0.00
32.00	.48	-84.76	0.00	.00	0.00	0.00	.00	0.00
0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
376.00	5.63	327.27	0.00	.00	0.00	0.00	.00	0.00
0.00	.00	0.00	0.00	.00	0.00	218.00	3.27	999.99
218.00	3.27	999.99	0.00	.00	0.00	0.00	.00	0.00
9.00	.13	999.99	0.00	.00	0.00	0.00	.00	0.00
0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
0.00	.00	0.00	0.00	.00	0.00	99.90	1.50	-91.43
99.90	1.50	-91.43	0.00	.00	0.00	0.00	.00	0.00
0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
0.00	.00	0.00	0.00	.00	0.00	481.00	7.21	999.99
481.00	7.21	999.99	0.00	.00	0.00	0.00	.00	0.00
0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
65.30	.98	-35.98	0.00	.00	0.00	0.00	.00	0.00
0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
0.00	.00	0.00	0.00	.00	0.00	4,813.00	72.11	-47.97
4,813.00	72.11	-47.97	0.00	.00	0.00	0.00	.00	0.00
0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
5.00	.07	-28.57	0.00	.00	0.00	0.00	.00	0.00
37.50	.56	-59.15	0.00	.00	0.00	0.00	.00	0.00
0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
0.00	.00	0.00	0.00	.00	0.00	15.80	.24	-98.38
15.80	.24	-99.38	0.00	.00	0.00	0.00	.00	0.00
0.00	.00	0.00	0.00	.00	0.00	223.00	3.34	999.99
223.00	3.34	999.99	0.00	.00	0.00	0.00	.00	0.00
0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
0.00	.00	-100.00	0.00	.00	0.00	0.00	.00	0.00
0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
6,674.90	100.00	-57.84	0.00	.00	0.00	5,850.70	87.65	-48.65

Table A3—Characteristics of Bureau of Indian Affairs timber harvest in Montana, by agency and county of destination, 1970 and 1975.

Destination County	Blackfoot			Crow			Flathead			Belknap		
	1975 Timber Harvest Volume (MMBF)	Percent	% Harvest Change 1970-75	1975 Timber Harvest Volume (MMBF)	Percent	% Harvest Change 1970-75	1975 Timber Harvest Volume (MMBF)	Percent	% Harvest Change 1970-75	1975 Timber Harvest Volume (MMBF)	Percent	% Harvest Change 1970-75
Beaverhead	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Bighorn	0.00	.00	0.00	650.00	1.47	550.00	0.00	.00	0.00	0.00	.00	0.00
Blaine	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Broadwater	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Carbon	0.00	.00	0.00	0.00	.00	-100.00	0.00	.00	0.00	0.00	.00	0.00
Carter	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Cascade	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Chouteau	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Custer	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Daniels	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Dawson	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Deer Lodge	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Fallon	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Fergus	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Flathead	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Gallatin	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Garfield	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Glacier	26.00	.06	99.31	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Golden Valley	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Granite	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Hill	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Jefferson	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Judith Basin	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Lake	0.00	.00	0.00	0.00	.00	0.00	4,899.50	11.90	-76.55	0.00	.00	0.00
Lewis and Clark	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Liberty	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Lincoln	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Madison	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
McCone	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Meagher	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Mineral	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Missoula	0.00	.00	0.00	0.00	.00	0.00	29,889.00	67.66	75.15	0.00	.00	0.00
Musselshell	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Park	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Petroleum	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Phillips	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Pondera	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Powder River	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Powell	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Prairie	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Ravalli	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Richland	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Roosevelt	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Rosebud	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Sanders	0.00	.00	0.00	0.00	.00	0.00	7,473.50	16.92	4.09	0.00	.00	0.00
Sheridan	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Silverbow	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Stillwater	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Sweet Grass	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Teton	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Toole	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Treasure	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Valley	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Wheatland	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Wibaux	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Yellowstone	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
Exports	0.00	.00	0.00	838.00	1.90	999.99	0.00	.00	0.00	0.00	.00	0.00
TOTAL	26.00	.06	-99.31	1,488.00	3.37	485.83	42,262.00	95.67	-6.37	0.00	.00	0.00

Rocky Boy 1975 Timber Volume (MMBF)	Rocky Boy Harvest Percent	Rocky Boy % Harvest Change 1970-75	1975 Timber Volume Totals per Destination County	Harvest Percent State	Percent Change 1970-75	Peck 1975 Timber Volume (MMBF)	Peck Harvest Percent	Peck % Harvest Change 1970-75	Cheyene 1975 Timber Volume (MMBF)	Cheyene Harvest Percent	Cheyene % Harvest Change 1970-75
0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
0.00	.00	0.00	650.00	1.47	550.00	0.00	.00	0.00	0.00	.00	0.00
0.00	.00	-100.00	-100.00	.00	-100.00	0.00	.00	0.00	0.00	.00	0.00
0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00	0.00	.00	0.00
0.00	.00	0.00	0.00	.00	-100.00	0.00	.00	0.00	0.00	.00	0.00
0.00	.00	0.00	0.00	.00	0

Table A4— Characteristics of U.S. Forest Service timber harvest in Montana, by national forest and county of destination, 1970 and 1975.

Destination County	Beaverhead National Forest			Bitterroot National Forest			Custer National Forest			Deer Lodge National Forest			Flathead National Forest		
	1975 Timber Harvest Volume (MMBF)	Percent	% Harvest Change 1970-75	1975 Timber Harvest Volume (MMBF)	Percent	% Harvest Change 1970-75	1975 Timber Harvest Volume (MMBF)	Percent	% Harvest Change 1970-75	1975 Timber Harvest Volume (MMBF)	Percent	% Harvest Change 1970-75	1975 Timber Harvest Volume (MMBF)	Percent	% Harvest Change 1970-75
Beaverhead	8,152.6	1.84	47.25	0.0	.00	.00	0.0	.00	.00	1,317.4	.30	999.99	0.0	.00	.00
Bighorn	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
Blaine	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
Broadwater	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	4,464.4	1.01	999.99	0.0	.00	.00
Carbon	0.0	.00	.00	0.0	.00	.00	339.3	.08	33.06	0.0	.00	.00	0.0	.00	.00
Carter	0.0	.00	.00	0.0	.00	.00	3.0	.00	999.99	0.0	.00	.00	0.0	.00	.00
Cascade	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
Chouteau	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
Custer	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
Daniels	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
Dawson	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
Deerlodge	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	510.8	.12	-54.39	0.0	.00	.00
Fallon	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
Fergus	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
Flathead	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	98,379.6	22.26	-21.24
Gallatin	0.0	.00	-100.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
Garfield	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
Glacier	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
Golden Valley	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
Granite	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	743.1	.17	-76.21	0.0	.00	.00
Hill	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
Jefferson	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	520.3	.12	87.36	0.0	.00	.00
Judith Basin	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
Lake	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	10,856.8	2.46	93.29
Lewis and Clark	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
Liberty	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
Lincoln	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	638.5	.14	-92.10
Madison	201.7	.05	-20.28	0.0	.00	.00	0.0	.00	.00	0.0	.00	-100.00	0.0	.00	.00
McCone	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
Meagher	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
Mineral	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
Missoula	0.0	.00	.00	7,423.3	1.68	-38.52	0.0	.00	.00	1,778.2	.40	-26.05	4,595.2	1.04	98.22
Musselshell	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
Park	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
Petroleum	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
Phillips	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
Pondera	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
Powder River	0.0	.00	.00	0.0	.00	.00	24.3	.01	-55.25	0.0	.00	.00	0.0	.00	.00
Powell	2,355.0	.53	999.99	0.0	.00	.00	0.0	.00	.00	4,811.0	1.09	-66.95	0.0	.00	.00
Prairie	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
Ravalli	760.0	.17	-92.54	16,316.7	3.67	-51.07	0.0	.00	.00	0.0	.00	-100.00	0.0	.00	.00
Richland	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
Roosevelt	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
Rosebud	0.0	.00	.00	0.0	.00	.00	17.2	.00	-97.33	0.0	.00	.00	0.0	.00	.00
Sanders	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
Sheridan	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
Silverbow	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	3,200.1	.72	28.49	0.0	.00	.00
Stillwater	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
Sweet Grass	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
Teton	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
Toole	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
Treasure	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
Valley	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
Wheatland	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
Wibaux	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
Yellowstone	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
Exports	0.0	.00	.00	0.0	.00	.00	223.7	.05	-76.28	0.0	.00	.00	0.0	.00	.00
TOTAL	11,469.3	2.59	-34.32	23,640.0	5.35	-47.72	607.5	.14	-67.98	17,345.3	3.92	-29.66	114,470.4	25.9	-18.77

Gallatin National Forest			Helena National Forest			Kootenai National Forest			Lewis and Clark National Forest			Lolo National Forest		
1975 Timber Harvest Volume (MMBF)	Percent	% Harvest Change 1970-75	1975 Timber Harvest Volume (MMBF)	Percent	% Harvest Change 1970-75	1975 Timber Harvest Volume (MMBF)	Percent	% Harvest Change 1970-75	1975 Timber Harvest Volume (MMBF)	Percent	% Harvest Change 1970-75	1975 Timber Harvest Volume (MMBF)	Percent	% Harvest Change 1970-75
0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
0.0	.00	.00	3,645.3	.82	-13.26	0.0	.00	.00	112.0	.03	999.99	0.0	.00	.00
0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	834.7	.19	319.24	0.0	.00	.00
0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	-100.00	0.0	.00	.00
0.0	.00	.00	0.0	.00	.00	33,788.8	7.64	62.94	0.0	.00	.00	8,163.1	1.85	30.10
1,623.3	.37	-90.67	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	-100.00	0.0	.00	.00
0.0	.00	.00	0.0	.00	-100.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	142.4	.03	757.83	0.0	.00	.00
0.0	.00	.00	0.0	.00	.00	132.7	.03	999.99	0.0	.00	.00	0.0	.00	-100.00
0.0	.00	.00	1,046.1	.24	-46.56	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
0.0	.00	.00	0.0	.00	.00	90,074.2	20.38	-44.75	0.0	.00	.00	0.0	.00	.00
0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
0.0	.00	.00	1,116.1	.25	-32.62	0.0	.00	.00	11,378.8	2.57	-18.70	0.0	.00	.00
0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	23,915.6	5.41	82.11
0.0	.00	.00	1,970.7	.45	-69.75	1,206.7	.27	999.99	0.0	.00	.00	44,667.2	10.10	-46.97
0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
3,650.5	.83	-57.22	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	-100.00	0.0	.00	.00
0.0	.00	.00	282.6	.06	-83.29	0.0	.00	.00	0.0	.00	.00	252.5	.06	999.99
0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	112.3	.03	999.99
0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
0.0	.00	.00	0.0	.00	.00	14,357.9	3.25	-30.99	0.0	.00	.00	18,749.5	4.24	-25.44
0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
111.6	.03	-15.39	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	58.4	.01	-94.50	0.0	.00	.00
0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	-100.00	0.0	.00	-100.00
0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00	0.0	.00	.00
0.0	.00	-100.00	0.0	.00	.00	13,114.3	2.97	-26.73	0.0	.00	.00	0.0	.00	-100.00
5,385.4	1.22	-79.34	8,060.8	1.82	-51.35	152,674.6	34.54	-31.37	12,526.3	2.83	-22.93	95,860.2	21.69	-31.68

Table A4 (continued)

Total Harvest Percentages	TOTALS 1975 Total Volumes	Total Percent Change
2.14	9,470.0	71.05
.00	0.0	.00
.00	0.0	.00
1.86	8,221.7	95.64
.08	339.3	33.06
.00	3.0	999.99
.19	834.7	319.24
.00	0.0	.00
.00	0.0	.00
.00	0.0	.00
.00	0.0	.00
.12	510.8	-54.39
.00	0.0	.00
.00	0.0	-100.00
31.75	140,331.5	-7.63
.37	1,623.3	-91.41
.00	0.0	.00
.00	0.0	.00
.00	0.0	-100.00
.17	743.1	-79.33
.00	0.0	.00
.12	520.3	87.36
.03	142.4	757.83
2.49	10,989.5	-14.44
.24	1,046.1	-46.56
.00	0.0	.00
20.52	90,712.7	-46.98
.05	201.7	-46.00
.00	0.0	.00
2.83	12,494.9	-20.17
5.41	23,915.6	82.11
13.94	61,641.6	-42.68
.00	0.0	.00
.83	3,650.5	-57.22
.00	0.0	.00
.00	0.0	.00
.00	0.0	-100.00
.01	24.3	-55.25
1.74	7,701.1	-52.60
.00	0.0	.00
3.87	17,089.0	-61.07
.00	0.0	.00
.00	0.0	.00
.00	17.2	-97.33
7.49	33,107.4	-27.95
.00	0.0	.00
.72	3,200.1	28.49
.00	0.0	.00
.03	111.6	-15.39
.01	58.4	-94.50
.00	0.0	.00
.00	0.0	.00
.00	0.0	.00
.00	0.0	-100.00
.00	0.0	.00
.00	0.0	.00
3.02	13,337.0	-63.62
100.00	442,039.8	32.18